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TEACHERS' UNDERSTANDING OF OPERANT LEARNING PRINCIPLES

by


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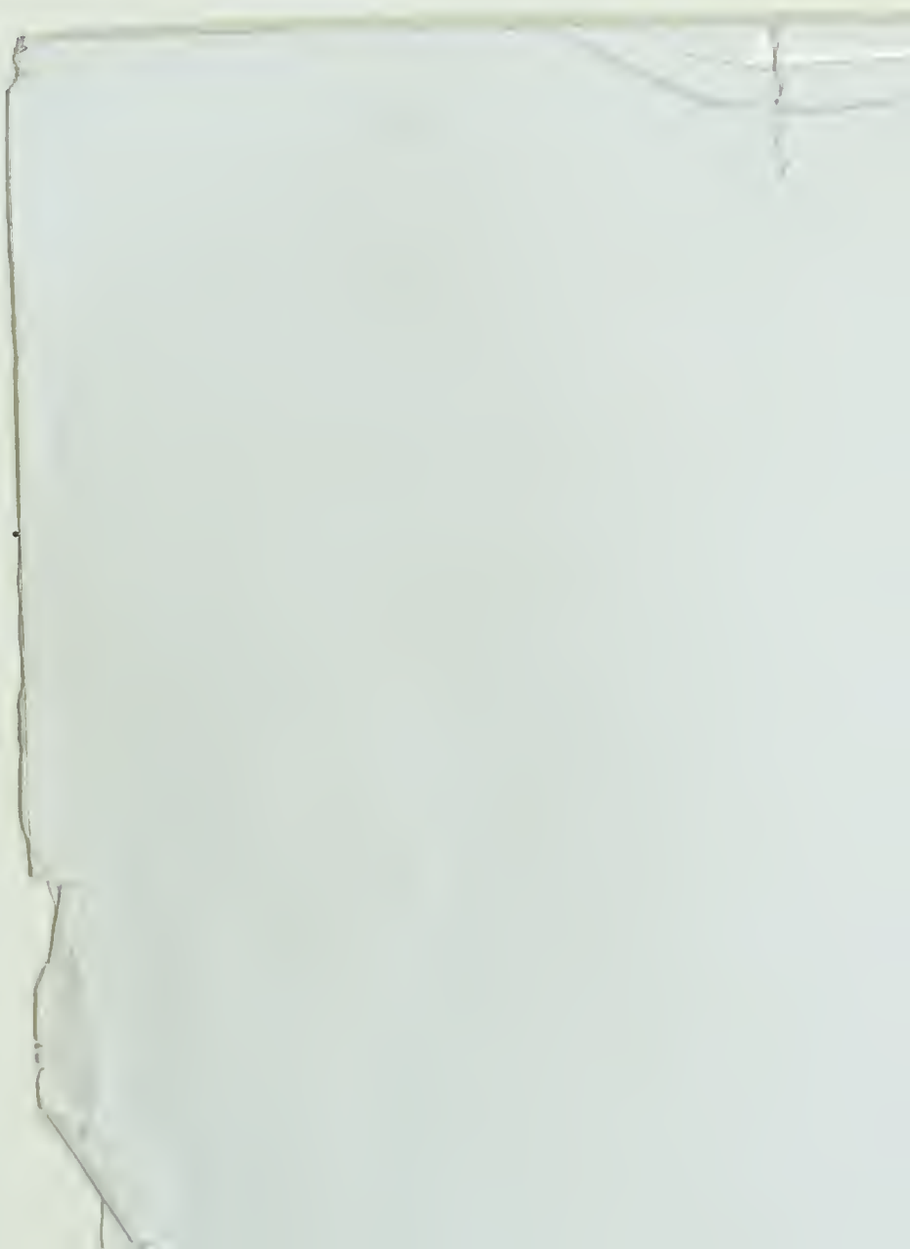
The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Teachers' Understanding of Operant Learning Principles submitted by Patrick Bickersteth in partial fulfilment of the requirements for the degree of Master of Education.



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ABSTRACT

The study was conducted to discover how knowledgeable practising teachers were about operant learning principles. The Operant Principles Test was constructed to measure understanding of the principles of operant conditioning, especially as applied in classroom teaching and learning. The Operant Principles Test was administered to three samples--teachers, student teachers and non-teachers. Comparisons among these groups were made, using a one way analysis of variance method.

The results indicated that practising teachers and student teachers were more knowledgeable of operant principles than non-teachers. However practising teachers were no different from student teachers in their understanding of operant learning principles.

The implications of this finding were discussed in relation to the feasibility of utilizing the principles of operant conditioning in the classrooms, at the present time. The significance as well as the deficiencies of the study was discussed.

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I owe special gratitude to my wife, Farrella, who spent many laborious hours typing the manuscript, while simultaneously working and keeping house. Moreover just her presence and that of Bertrand our child provided my greatest impetus for diligent, constant expenditure of effort.

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CHAPTER I

THE STUDY AND ITS BACKGROUND

Introduction

The success of the application of operant learning principles has been demonstrated in numerous learning situations (e.g. The Juniper Gardens Children's Project 1968; Staumphauzer and Bishop 1969; Bailey and Meyerson 1969; Smith and Sanders 1968). It has also been frequently shown that the principles of operant conditioning can be successfully applied in the classroom (e.g. Becker 1969; Hauserman & McIntire 1969; Hamblin & Buckholdt 1967; Harman, Gelfand & Neilson 1970; Hall, Panyan, Robon & Brodein 1968; O'Leary, Becker, Evans & Saudargas 1969; Schaeffer, Harris & Greenbaum 1968-1969; Andrews, 1970).

Learning theory in this regard, requires the understanding of the principles of operant conditioning and their application under controlled situations, example, Skinner (1966, 1968); Skinner and Ferster (1957); Hull (1943); Staats & Staats, (1966); Bijou (1970). These principles have sometimes been identified with the principles of behavioral engineering or behavior modification. The latter refers to the application of the principles of operant conditioning outside the laboratory (Homme, Baca, Cottingham & Homme 1968). Operant learning principles then, have been

taken here to refer to those principles of learning which

1. utilize the operation of reinforcement and other behavioral contingencies;

2. have been found effective in controlling the modification or shaping of verbal and non-verbal behavior; and

3. have particular relevance for classroom learning behavior (see Appendix A).

Operant conditioning is not intended here as a restrictive concept but as a central and convenient concept in behavior change processes. Accordingly then, it is taken to include various aspects of token economy programs, behavior modification programs, programmed instruction and precision teaching approaches. While these terms are not always interchangeable because they sometimes involve distinguishable techniques, they evolve basically from S-R principles of learning and particularly from operant conditioning. Since the literature indicates that the techniques of operant conditioning are successful and productive for teaching and learning, it seemed important to investigate first whether teachers or educators understand the principles of learning which underlie operant techniques.

The major purpose of this study was to discover how knowledgeable practising teachers are about behavioral learning principles which can and have been used in the classroom, to improve learning. It was proposed in this connection that samples of current teachers, student teachers and non teachers would be tested on their under-

standing of operant learning principles to discover whether there was any difference in understanding among these three groups;i.e. respectively, those who have been formally trained to teach, those who were being trained and those who have never been formally trained. These three groups would hereafter be designated, respectively, as teachers, student teachers and non teachers.

The test on which teachers' understanding was assessed was constructed according to the rules and suggestions given in "Standards for Educational and Psychological Tests and Manuals" (American Psychological Association, 1966).

The study was guided by the following hypotheses:

Hypotheses

1. There would be no difference between the mean scores obtained by current teachers and non teachers, on the Operant Principles Test.

2. There would be no difference between the mean scores obtained by teachers and student teachers, on the Operant Principles Test.

3. There would be no difference between the mean scores of student teachers and those of non teachers.

Procedure

To obtain data relating to the hypotheses, the following steps were proposed:

1. Construction of the Test Instrument

The investigator proposed to obtain topics and subtopics relevant in testing knowledge of operant learning principles. In this regard,

it was considered important to pay particular attention to the classroom applicative aspects of these principles. The next step was to construct a large number of multiple-choice questions under each topic or subtopic. For example, there would be about ten or fifteen items which dealt only with positive reinforcement or with conditioned reinforcement. The nature of these items would involve definition of operational terms, factual and non factual statements about certain familiar experimental findings, as well as information relating to possible classroom applications. When these would have been constructed, the best items, on a subjective assessment, would be selected to form an initial battery. This initial form of the test would be edited by people knowledgeable in behavioral principles to establish content validity, followed by the first administration which would provide data for item analysis. The proposed method for item analysis was to use the Kuder-Richardson formulas or their computer-documented forms. Results of this item analysis was to determine whether further restructuring of the test would be necessary.

2. The Sample

The sample was to consist of three parts which respectively comprised teachers, student

teachers and non teachers. The teachers were to be currently practising the profession and student teachers were students involved at present in a teacher-training program. Non-teachers were to be derived from the general public and were to comprise individuals which did not fall in either of the other two categories.

3. Administration of the Test

The Operant Principles Test was then to be administered to these three samples, as far as possible simultaneously, and under the same conditions. The computation of the scores obtained from these administrations was expected to yield statistical data indicating that the hypotheses tested were to be rejected or not.

Significance of the Study

1. As indicated by research studies, Operant Learning Principles have been successfully applied in a wide range of learning situations including the classroom. One significance of this study was to be that it indicated (if the experimental hypotheses were upheld) the relative lack of familiarity of teachers currently in the profession with behavioral learning principles. Here then, relative to the degree of consistency in the application of these principles, a serious deficit or problem would appear to

be present. Further investigations might explain the magnitude, and provide suitable solutions. If the hypotheses were rejected it would be clear that teachers did not understand these principles of learning and would be left to discover with what success they could be applied or were being applied in the classroom--and the relative weights of their advantages and disadvantages.

2. This study seemed to raise the question of the need for establishing standards of professional competence--that is, in relation to what a teacher actually knew about teaching and learning. It would seem feasible to construct and validate a battery of tests involving other principles of learning and teaching which would be used (with the O.P.T.) as an objective instrument for determining the professional competence of a teacher.

CHAPTER II

A REVIEW OF THE LITERATURE

Operant principles of learning have been applied to various classroom situations with a view to demonstrating their effectiveness in improving learning. This section considers a small sample of the successful work done in this regard.

Homme (1969) reported instances which provided evidence of the success of contingency management. He described contingency management as "a crucial bit technology derived from operant conditioning...." The experiments were done with subjects with different social backgrounds, ages and levels of mental development. His samples consisted of normal, middle-class, three year olds; children from poor families; adolescents, described as having behavior pattern typical of "street kids;" preschool Indian children; a five year-old non-talking retardate and a blind 16 year old inmate of a state mental hospital. The Premack principle was used, and in each of these cases the investigator reported significant improvement in behavior. This was not a research report, but given such a diverse range of subjects and the consistency of success reportedly achieved with them, it seemed indeed to lend support to the belief that operant learning principles could be applied widely with reasonable

success.

The Juniper Gardens Children's Project sponsored by the University of Kansas reported (August 1968) the successful application of certain operant learning principles (e.g. positive reinforcement, punishment and modelling). The project aimed at improving academic and social behaviors during class and after class, assisting remedial teaching, and teacher and parent training. This project involved the participation of the project staff, university students in training, teachers, principals, counsellors, and parents. The project consisted of three major phases. The first phase involved an "Analysis of the effects of reinforcement contingencies arranged for increasing accuracy and rate of academic performance and appropriate classroom behavior." (p.1). Four experiments were set up to observe effects on academic behaviors (experiments I and II); competitive behavior (experiment III) and non-academic pro-learning behaviors (experiment IV). In two of the four experiments the effectiveness of a token reinforcement program, as a means of improving academic accuracy was established. The third experiment demonstrated that irrespective of the setting (i.e. competitive or non competitive) reinforcement contingencies influenced behavior. In both settings academic accuracy varied as a function of contingent reinforcement. The fourth experiment concluded on the effectiveness of peer control as a reinforcer for

desired behaviors, when the effects of reinforcement gain or reinforcement loss were shared by the group. A sub-phase of the project was introduced to test the hypothesis that the learning of low income children would be greatly improved if the reading program was supplemented by auditory material. Auditory stimulation was here deemed as effective in maintaining learning vigor. Thus for the purposes of the project, auditory material was a reinforcing stimulus. The evidence provided by the study supported the hypothesis. Thus this phase, within the framework of the entire project, additionally provided supportive evidence that the appropriate application of reinforcement contingencies produced improved learning tendencies. The second phase analyzed the effects of reinforcement contingencies on certain classroom behaviors. The basic procedure here was to reward appropriate behavior with attention and provide no reinforcement for inappropriate behavior (i.e. a specifically defined appropriate study behavior was made the occasion for reinforcement, while non-study behavior was ignored). The overall conclusion from these experiments is that various appropriate academic and social behaviors could be taught by teachers and maintained at a high level of efficiency in the classroom through the application of operant principles which have effectiveness with individuals as well as with groups or an entire class. It seemed demonstrated quite clearly in these studies that a proper

understanding of these principles of learning was essential to their successful application. For example "less dramatic results" were reported for a case in which a teacher "failed to carry out...the suggested procedures..." (p. 17). The third phase of the project which studied parent-child social reinforcement patterns indicated that a lack of the knowledge of operant principles made some efforts of parents to improve home study behaviors of their children unproductive. On the other hand, the proper use of operant techniques resulted in remarkable increases in the learning of their children. For example, increase in reading rate followed from help with difficult words, that is to say, "removing" the aversiveness of difficult words produced negative reinforcement for further reading efforts. Although the study reported that further analysis was necessary to establish the direct cause of reading improvement, there was enough evidence in the preliminary investigations to associate increase in learning with the effectiveness of the operant principles which were applied.

A project conducted by Patsy Knowles and others (1969) aimed at evaluating the operant learning method of teaching disruptive and non-learning students in the classroom. Operant techniques of behavior modification were taught in a number of school settings to demonstrate among other things that these principles of learning could successfully be applied in the classroom with children

from all walks of life. This project principally utilized principles involving primary and secondary reinforcement with some aversive contingencies which were applied to individuals as well as groups. The children's behaviors which were being subject to modification included rocking in chair, feet kicking, thumb sucking, shooting paper wads, pulling hair, hyperactive behavior, changing seats, talking when not supposed to, incompleted work, emptying desk unnecessarily, forgetting to wear glasses, breaking rules, interrupting and hitting behaviors. Other behaviors also related to school work were observed e.g. attitude to school work, behaviors involving daydreaming, tardiness, disruptive behavior prior to lunch or during physical education, during lunch, not completing homework, and insisting on being accompanied to school by mother. Behaviors typical of the home which were also studied included inappropriate bowel movement, refusing to eat, bedwetting, unnecessary whining, throwing things around the house, not cleaning room and disruptive behavior presumably resulting from sexual assault.

The study evaluated these various kinds of behaviors in terms of how many times or how long at a time the behavior was performed or was not performed. Subjects were chosen from three school systems, a guidance group, and a parent group. Seventy-seven behaviors altogether were observed. Modification was completely successful in most of the cases and in the few unsuccessful cases

encountered failure was accounted for largely on the basis of an ineffective or improper control of relevant variables. The conclusion of the investigators was that the project demonstrated the applicability of behavior-modification techniques in the public school setting. "They (the principles) can be applied not only to traditionally exceptional child populations but also to normal and culturally deprived populations" (p. 92). The data further made clear that "behavior modification techniques can be applied by teachers, parents and guidance personnel to bring forth significant changes in the behavior of children from all walks of life" (p. 95).

Becker and others (1969) evaluated various methods of reducing behavior problems and recommended a guide by which teachers, parents or anyone involved in training children could apply operant conditioning principles to effect appropriate behavior changes. In their review of recent research findings the authors state their impression that at least 80 per cent of present referrals to psychologists could be successfully handled by the teacher in the regular classroom.

Some of the studies reported in detail showed that there was support for the fact that the successful or effective use of operant techniques depended almost exclusively on the understanding of the principles of operant conditioning. For example, for reinforcement to

be productive it should be contingent on the desired behaviors. Ignoring unsuitable behaviors tended to reduce the probability of their frequency. The studies involved applications of learning theory principles in elementary classrooms and preschools. Various categories of child behaviors which interfered with school learning were observed, as well as some traditional methods of managing these inappropriate behaviors. Results of the studies indicated that teachers using different "teaching styles" can effectively apply principles of operant conditioning and obtain remarkable results over a wide range of classroom behavior problems. In all cases deviation from a systematic application of operant principles resulted in the acquired desired behaviors being dropped and inappropriate behaviors reinstated. The experiments of Madsen, Thomas, Kaser and Plager (1968), of Hall, Lund and Jackson (1968), of Thomas, Becker and Armstrong (1968), of O'Leary and Becker (1967) and of Carlson, Arnold, Becker and Madsen (1968) reported in this review indicated, quite clearly, the effectiveness of rewarding an alternative desired behavior over and above presenting aversive stimuli (or "punishment") to eliminate undesired behavior. Teachers who used the latter method failed to shape the children's behavior in the desired way whereas when the operant method of rewarding the desired behavior was used, a significant change was effected in the inappropriate behavior. This was further support for the superiority

of the operant method over some traditional methods.

Apart from confirming that when applied consistently operant learning principles produced behavior changes in the direction desired, all other things being equal, the evaluation also mentioned certain specific advantages of the operant method. For this method to be maximally effective in the classroom it should be directed towards improving learning and achieving academic success. The studies of Thomas, Neilson, Kuypers and Becker (1968) to which reference was made as well as the as yet unreported study of Varna, Garis and Becker supported this view. When thus directed, definite accountable patterns in behavior are produced and maintained if desired or eliminated if undesirable. Another advantage was to be found in the fact that certain specific maladaptive behaviors were eliminated even though operant procedures were directed on other kinds of inappropriate behaviors (cf. also Smith and Sanders, 1968).

A distinct merit of this research review was that it provided for the practical utility of operant conditioning principles. The "Handbook" nature of the evaluation, made it practicable for precise instructions to be stated regarding the use of operant methods of teaching. In addition, possible sources of failure or adverse effects were indicated so that teachers especially, would know what to expect when they used operant conditioning. The value of this document cannot be over-

estimated or overstressed both because the document was an informative source regarding the wide and successful application of operant learning principles and because it provided teachers of all categories with a practically structured guide to improve their teaching and the learning of their pupils.

A study intended to test the effectiveness of a preschool program, in connection with "It Works Preschool Program in Compensatory Education" (1969) was carried out for two years with five year-old lower class (predominantly negro) children. The preschool program emphasized "rapid attainment of basic academic concepts." Learning was induced by the use of negative and positive reinforcement. The two points of significance which emerged from this study was first, that academic achievement not only improved but was also successfully accelerated in subjects whose previous academic level was regarded as indicative of "low intelligence." In the two years the research lasted results from the Stanford-Binet showed a total gain of 25.75 points for the experimental group and only 5.11 for the control group. Secondly, the study provided evidence that the use of reinforcement principles need not interfere with or violate the objectives of other child experts. In effect, not only have these principles been applied to different types of children in different kinds of schools, they could fit into different curricular and broad structural settings.

Hall, Panyan, Rabon and Broden (1968) provided evidence in their study that when beginning teachers had some knowledge of reinforcement procedures their control over the class and the learning behavior of the pupils were both improved.

The above research was carried out as part of the Juniper Gardens Children's Project which studied mainly culturally deprived children. Three beginning teachers (two of them recent college graduates) were used in this study and were chosen "because of continued high rates of poor discipline and other non-study behaviors" in the classes they supervised. Grades one, six and seven chosen from two Kansas City schools were involved in the experiment. In each of the three cases data was first collected whereby the frequency of disruptive and non-learning behaviors could be determined. Secondly, reinforcement principles and procedures were discussed with the teachers in conjunction with the previously recorded baseline behaviors. The third phase involved the application of these principles in the actual classroom situation.

In all the instances where reinforcement principles were applied learning behaviors were significantly improved (e.g. 65 and 79 per cent improvement in two cases). During reversal periods (unexplained in one instance) study behaviors were significantly reduced (e.g. to within

baseline range in one instance). The reinstatement of the previous conditions produced significant improvements in learning behaviors.

The reinforcing contingencies were mainly teacher attention, positive comments, a loved study game and access to a between-period break.

The conclusion of the researchers was that a behavior analysis approach to education would allow education authorities to assist beginning teachers to cope with the problem of classroom management through the systematic use of reinforcement contingencies. The study on the whole provided further evidence of the successful application of operant learning principles. But, in essence, it indicated the facility with which even "novices" in the teaching profession could come to learn and apply behavioral principles with reasonable success and effectiveness.

Stumphauzer and Bishop (1969) proposed that Saturday morning television cartoons or similar programs could be successfully utilized to control certain undesirable behaviors in children. They stated that a time out from positive reinforcement paradigm as previously indicated by Baer (1962) could be used to eliminate thumbsucking and finger scratching in a 'natural' atmosphere outside the laboratory.

This method involved a relatively inexpensive switching apparatus (.59¢) which could be connected to a television set and operated from another room out of sight of the child. The process would involve switching off the television program when the undesired behavior started and switching it on when the behavior terminated.

For greater precision in the contingency management it was suggested that a closed circuit television with standard cartoon films might be used - costing about $1.00 beyond the price of the television set.

The merit of this proposal was the opportunity it indicated for the systematic use of reinforcement contingencies at home. Parents therefore could also be taught to improve learning and social behaviors of their children using relatively objective methods.

Zimmerman, Zimmerman and Russell (1969) used token reinforcement, praise and time out with a class of retarded children to teach instruction-following behavior. The study involved "the concurrent exposure of all class members to a single, specific set of differential-reinforcement contingencies" (p. 101). The experimentally designed instructions were paced on the basis of the subjects' responses rather than on the subjective judgment of the teacher, because the study was aimed at devising objective instructional procedures which a teacher working alone could use.

The significance of this study for our purpose was the evidence it gave in support of the necessity for understanding operant learning principles before they could be applied effectively. For example, the authors used praise and token reinforcement to maintain desired behaviors. Since praise, itself a social reinforcer, failed to produce significant change, it seemed demonstrated that it was essential to be aware of the relative effectiveness of various contingencies and to know how to apply them selectively or differentially. In this study, the methodology indicated, and the authors referred to their bias for, "the systematic arrangement of an environment and the systematic application of (a) given treatment..."(p.112). This however is the basis of contingency management and the focus of operant techniques. For these optimal conditions to be created then, for operant learning to take place, behavior change agents should be properly instructed in the basic principles of operant conditioning. This study also made mention of social behaviors which were not specifically taught but which it seemed were learnt in the process of applying token reinforcement procedures to teach other behaviors (cf. Smith & Sanders, 1968; Becker, 1969).

Malott and Svinicki (1969) described the success of contingency management procedures in an introductory psychology course. The procedures involved the rearrangement of reading assignment schedules, laboratory

work, and examinations in order to maintain more frequent reinforcement schedules and ensure correct responding. An easily avoidable aversive contingency ensured that certain "mastery or 'A' level requirements" were achieved. They reported the following results: "The students work about 12 hours per week for 3 hours of credit; 80% to 90% earn a final grade of 'A' (i.e. the highest grade) and less than 2% receive an 'F' (i.e. a fail). This is the case even though high academic requirements are imposed" (p.550). By the use of daily peer grading (edited by teaching apprentices and assistants) contingency management was extended to apply to certain administrative matters which helped to solve problems related to faculty-student ratio. The result was significant cuts in management costs. The study further reported that as a function of programming, the faculty was able to respond to certain special needs of students (over 1000 students) in a way they would not have, using more traditional procedures. The significance of this study was the indication that by systematically managing learning behaviors of students (i.e. contingency management of study and exam habits) the possibility existed of shaping complex behavior in a mass educational setting with reasonable success.

McMichael and Corey (1969) considered some important questions relating to the use of contingency management techniques to teach material in a standard text book.

The study attempts to assess the relative effectiveness of contingency management techniques in teaching over and above methods utilized by the conventional lecture system. The significantly higher mean scores of students who were taught by contingency management techniques demonstrated the superiority of the latter method of teaching over the conventional method of teaching the same material. According to the ratings of students as to which method of teaching was "better," it seemed indicated (though this matter was not systematically studied) that students would ordinarily prefer to be taught by contingency management techniques.

The value of this study for our purpose however, would seem to relate to the evidence it provided that operant learning principles could be applied in teaching University students to produce "better" learning. The study was important also because of the claim it made regarding the superiority of contingency management methods (i.e. basically operant learning principles) over a conventional method, which presumably did not make systematic use of operant learning principles. A further claim (not substantiated by experimental findings) involved the practicability of extending contingency management to allow "accelerated students" to do a laboratory experiment or write a paper on any area of special interest.

The significance of this possibility seemed immense. It meant that operant learning principles could be applied not only to definite bodies of specified knowledge (e.g. school subjects) but also to higher learning and scholarly investigations. This would seem to be a huge claim which should not be deemed preposterous. Indeed, the basis on which the success of operant learning has rested, has been the objectivity of the principles which sublie this method of promoting learning. The testimony of studies cited already and which many researchers as well as this study, would wish to assert, would be that these principles of learning could be applied to all levels and forms of learning; to all classes and categories of people. The particular emphasis of the present investigator was that the problem of effectiveness centered around adequate training and proper understanding of these principles of learning.

O'Leary, Becker, Evans and Saundargas (1969) partially replicated studies done earlier by O'Leary and Becker (1967) relating to the effectiveness of token reinforcement in conjunction with rules praise and ignoring. But their results were not identical. The reasons given for "the difference in effectiveness of the programs" merely indicated however that under different circumstances different behavior control factors could operate, and thus behavioral outcomes would vary from one circumstance to

the other. However, that reinforcers were scarce in this study seemed to indicate that there could be instances when operant learning principles would be difficult (though not impossible) to apply. These authors also advised caution regarding hasty conclusions about the dramatic success of a token reinforcement system. While this was wise it must be pointed out that this warning related particularly to the accepting of the results of their own experiments which due to various (peculiar) conditions did not permit, in all cases, conclusions with greater generalizability. Nevertheless the overall conclusion seemed to be that reinforcement procedures, systematically applied, were more economical (with regard to administrative costs and time) than the "clinical therapy" approach to dealing with disruptive behaviors.

The token reinforcement project carried out by Harman et al. (1970) would seem to indicate possible ways of dealing with the problem of scarce reinforcers. In these studies the sampling of reinforcers and the use of menus respectively were successfully employed to ascertain and assess the reward values of potential reinforcers.

Vogler and Martin (1969) considered criticisms by Lucero et al. (1968) made against operant conditioning techniques which have led to restrictions in the use of these techniques "in all of Minnesota's State mental institutions" (p. 59). The case made against operant

conditioning techniques involved the use of "aversive reinforcement" and "deprivation." The sanctions which followed restricted the use of aversive reinforcement and prohibited the use of deprivation. The use of positive reinforcement was endorsed.

The writers argued that criticisms centering around such issues usually arose from the errors of unqualified people and confusion with regard to terminology and procedures involved in operant conditioning. The work of the former have been mislabelled "operant conditioning" while confusion about terminology and procedures have been due to misunderstanding as well as improper evaluation. Basic to these points would be the understanding or knowledge that the behavior therapist essentially aimed "to help restore to the institutionalized those skills which he needs to gain his human dignity as a productive citizen living in the community"(p.60). Moreover in the hands of the qualified behavior therapist operant conditioning techniques would, as expected, be used skillfully and competently. The authors explained that proper understanding of the principles of operant conditioning as they applied particularly to terms like "deprivation" and aversive stimulus, and positive reinforcement would remove the present misconceptions. A somewhat pertinent issue raised here which would seem important in evaluating the effectiveness or practical utility of operant conditioning in any situation was

the relative incipience of the use of these procedures with people. In some instances the problem would not be the ineffectiveness of operant conditioning, but ineffective control of contingencies--in the same way for example that the failure of heart transplantation would not necessarily be due to the fact that hearts are not to be transplanted but probably because the skills should be improved. The writers noted in connection with the use of aversive conditioning with human beings that the situation was "much like the field of surgery was a century ago..." (p.61). They did not agree that restricting the use of these techniques would improve the situation. In fact, they envisaged that these steps would only result in depriving mankind of the immense potential benefits of these techniques.

The setting of this controversy was clearly clinical. But the notions which were refuted or explained were pertinent to other situations in which operant learning principles were involved. Thus, this paper served as a refutation not only of clinical objections but as well of objections from educational sources. It seemed to repeat the fundamental fact that the crux of success or failure in operant conditioning techniques lay respectively in the proper or skimpy understanding of the principles of learning involved.

Osborne (1969) applied principles of reinforcement to a class of deaf pupils to teach remaining-in-seat

behavior. He found that this inappropriate behavior dropped sharply. When the process was reversed out-of-seat behavior rose substantially.

Wahler (1969) considered the reinforcement power of parents in connection with the use of time-out procedures at home. He considered that the reinforcement value of parents' social attention was an important factor in the use of time procedures to control behaviors of children. His study was concerned with the elimination of oppositional behavior and the maintenance of cooperative behaviors in children. He also concluded that combined use of differential attentional contingencies and time-out procedures largely eliminated oppositional behavior, while at the same time maintaining cooperative behavior. The use of differential attention alone had failed to achieve this goal in an earlier study (Wahler 1968). It was proposed that the removal (time-out) of children from the social vicinity of the parents (source of positive reinforcemtnt) meant also time-out from other non-social reinforcers (e.g. toys or television). Hence time-out proved effective. It was also noted that parental value increased during the course of this experiment. This was so because with the reduction of oppositional behaviors in the children, relationship with the parents became considerably improved. As a result it would seem that the social reinforcement value of the parents (which was previously low) was raised significantly. This

study which provided a somewhat scarce example of the application of operant learning principles in family relationships was of tremendous significance. It demonstrated that the management of environmental contingencies was feasible in most situations, so long as basic procedural principles were systematically adhered to. The success of the procedures used in this study seemed to destroy belief in any supposed mystical bond in parent-child relationships. It indicated that like all human behavior the family relationship could be subject to objective laws. Thus, it indirectly made a case for the necessity of parents knowing how to handle their children through behavioral learning principles. The value of this implicit inference was that the fear of "good work" achieved in school being "undone" at home could be eliminated if both parents and teachers understood how to help children learn through the systematic application of learning principles (cf. Wahler et al. 1965--"Mothers as behavior therapists for their own children.")

One major area of research which has evolved from the general area of operant conditioning is the control of attentive behavior using certain reinforcement contingencies.

The study by Packard (1970) attempted to assess the degree of control over "classroom attention" which

a teacher could exert, "given the teaching activities currently valued in public education..." (p.16). The major conditions under which 'attention' was controlled involved the systematic manipulation of specific group contingencies. This study was an attempt to contribute to Hall's work (cf. Hall et al. 1968). The goal was to see to what extent a teacher in an ordinary classroom could control the attention of the whole class by making reinforcement conditions contingent upon appropriate attentive behaviors of the students. Baseline measures of levels of attending behaviors in different groups of students provided a basis on which certain behavioral criteria were established. Reinforcement contingencies for each group were determined in relation to the particular group's level of 'attention.' Comparisons were made among the groups of subjects of the relative effects, on attentive behaviors, of instructions alone from the teacher and when reinforcing group contingencies were added. The data as analyzed seemed to indicate that using instructions only (cf. Hall et al. 1968), the teacher's control over attentiveness was unreliable. "But coupling instruction with group contingencies produced significant, stable, and feasible maximization of classroom attention" (p.25).

The above study seemed valuable not only because it demonstrated the importance of the relationship between a response and a discriminative stimulus, but also for the evidence it provided collaterally of an increase in

motivated behavior of the teacher. Increase in motivated behavior seemed consequent upon the improved study and attentive behaviors of the student.

This study, incidentally, seemed to have utilized some of the more powerful reinforcement contingencies--token economy with back-up reinforcers determined by the children, feedback information which was provided before each new session, as well as discrimination conditioning.

The emphasis of the authors, was that "this procedure is an inexpensive and easily manageable one whereby the teacher can maximize the attention of each student though she relies on her less-than-precise measurement of the behavior and presentation of the consequences to the class as a whole" (p.27).

The emphasis of the present review would be even more basic. It would reiterate the importance of a proper knowledge of behavioral learning principles for the teaching profession as well as it would note the point of the foregone study, which was that it would be practicable to systematically implement and maximize the use of behavior analysis methods in the classroom. Initially, however, the crucial issue would be to determine the present state of knowledge among teachers, regarding the basic principles of learning theory.

That the contingent use of attention as a social reinforcer could be a highly skilled operation, has been

observed by Cooper et al. (1970) in their review of the relevant literature. In these previous studies the subjects comprised teachers trained in reinforcement principles and their practical application. In the Cooper study the subjects comprised pre-school teachers who had no previous training in these principles.

This study (Cooper et al. 1970) aimed firstly, at observing and recording teacher attending behaviors in relation to disruptive and appropriate classroom behaviors of the children. Secondly, it aimed to modify the teacher's attending behaviors by providing feedback regarding the frequency of her success (reported every ten minutes), the frequency of her failure (reported every two hours) as well as the daily rate of successful attention to appropriate behaviors in the children. Thirdly, the study observed the resultant level or rate of modified attending behavior in the teacher. These three objectives of the study were respectively designated as Baseline Period, Training Period and Probe.

The results indicated that constant feedback information shaped specific teacher attending behaviors, so that gradually they came to be made appropriately contingent upon desired child behaviors.

The research did not answer the important question of the durable effects of this shaping procedure. However it did provide, in the first place, confirmation regarding the relationship between teacher attention and

learning behaviors in children. In the second place it provided much needed evidence that ineffective teaching behaviors could be shaped to produce more appropriate behaviors which maintain learning, and on the basis of which a satisfactory learning and teaching relationship could grow.

The value of this research for our purpose would appear to be threefold. Firstly, it provided further information regarding the objectivity and usefulness of behavioral learning principles. Secondly, it would seem to demonstrate the need for consistency in teaching-behaviors especially those which directly affect the learning of children. Thirdly, it seemed to point out that already established teacher behaviors need not be an insurmountable obstacle to implementing behavioral principles in the classroom. Even these "conservative" behaviors could be modified by the use of various reinforcement contingencies.

The study conducted by Schutte and Hopkins (1970) considered certain issues in classroom management which have been traditionally designated "disciple and achievement problems." In particular, instruction-following behavior was studied in relation to contingent or non-contingent attention from the teacher. The literature reviewed in this study indicated the discriminative function of instruction, the continued successful compliance to which required contingent reinforcement. The

suggestion of this study then was that "the effects of instructions are determined by the consequences of the instructed behaviors and that teacher attention is a suitable and convenient reinforcer for the behavior of school children" (p.118).

The subjects were five kindergarten girls aged between 4.8 and 6 years. Ten instructions were frequently given by the teacher and the accompanying specified behavior was expected within 15 seconds. The experiment lasted for twenty sessions and was divided into four parts. A baseline was worked out followed by contingent attention and then a reversal phase, followed by a second contingent attention phase. The results showed that contingent attention improved instruction-following behavior.

While this study contained certain limitations regarding generalization to other classroom situations, it was a significant contribution to the list of proven cases that the systematic use of behavioral contingencies could be invaluable in the classroom. It indicated, specifically that behavioral principles could be used to significantly improve teaching conditions and learner behaviors. The use of preschool, normal, children would seem to further confirm the feasibility of applying these principles of learning to early age levels with significant educational gains. Here, after all, is where formal education begins and a most fitting point therefore to introduce

educational consistency!

One of the criticisms against behavior theory in general and operant paradigms in particular has been that no account seemed to be given of covert processes. However some research utilizing learning theory has been addressed to this problem.

Appley (1970) recently discussed the importance of internal processes such as intrinsic motivation in learning theory and stated: "If we did not believe in the possibility of manipulation of such internal processes, we would have little or nothing to offer the educator--or he his pupils!" (p.4). What Appley considered to be possible has been many times argued and sometimes empirically demonstrated to be practicable (cf. Staats and Staats 1966, Bandura, 1969).

Homme (1967, 1968) had discussed the present proficiency of behavior control technology and argued that behavior theory and technology had reached to the point at which both covert and overt behaviors could be successfully shaped. The term "coverants" was used to refer to internal processes like thinking and imagining--and these he argued could be brought under stimulus control conditions.

Many more attempts have been made to explore covert processes within the framework of behavior theory (cf. very recent attempt by Cautela, 1970). The problem has not been ignored in the classroom. A related study was

done by Glynn (1970). He compared the effects of self-determined, experimenter-determined and chance-determined reinforcement among samples of grade nine girls. His purpose was to indicate a useful way "to wean children from dependence on an external agent and at the same time.....permit the use of effective extrinsic reinforcers" (p.124). Six phases were studied as follows: Baseline I, Token I, Withdrawal I; Token II, Baseline II and Review. The dependent variables observed in the study were: (a) Test performance (b) Performance-token ratios and (c) Inter-class communication. The author noted that important as the results of this study may be, the particular kind of children (well motivated, little or no behavior problems) and the narrow range of self-determined reinforcement conditions would require caution in generalizing their conclusions to other classroom situations (example underprivileged, preschool). But, it was noted that the study provided useful indications regarding the effectiveness of self-determined reinforcement. The results of the study showed that the children (just as well as the experimenter) could successfully regulate token reinforcement for classroom learning. Thus the belief that teacher-mediated social reinforcement was a crucial factor in token reinforcement seemed seriously challenged (cf. Kuypers et al. 1968).

The importance of this study for our purpose would seem to be the support it appeared to give to the

notion that self-determined or self monitored reinforcement procedures (within certain prescribed contexts) could be meaningfully utilized to enhance student learning. The study further demonstrated the importance of differential reinforcement contingencies as it would relate to previous reinforcement history. Previous experience with reinforcement contingencies seemed to exert some control over the degree of effectiveness of differential reinforcement. However the basic factor in this study seemed to be the judgment of the subjects; and this in effect was the behavior being shaped.

A long standing criticism against token reinforcement has been related to the fear that children trained in this atmosphere would become helplessly dependent upon tokens and would be unable to perform without them. The design of the above study permitted the observation of this factor and yielded figures which indicated that this criticism (and related fears) did not seem to have experimental justification.

In sum, then, the study demonstrated the usefulness (and "harmlessness") of token reinforcement procedures in the classroom and suggested that time and energy could be saved by employing self-determined reinforcement techniques, with no loss in learning increment.

There have been some criticisms regarding the application of operant principles of learning to human

behavior.

Burchard (1969) attempted to defend the effectiveness of a behavior modification program among mild retardates, against criticism levelled by Lachenmeyer (1969). The issue was over a program initiated to evaluate the use of behavior modification techniques which used a structured environment, "in which behavioral contingencies were controlled in accordance with the principles of operant conditioning" (p.259).

Lachenmeyer pointed out the difficulties involved and the maladaptiveness of the whole program. Burchard however regarded some of these criticisms as valid but indicated that the critic had been unjustifiably selective in the points he attacked and had given a distorted total picture. Burchard conceded the problem of contingencies which remain uncontrolled in a controlled environment. The contingencies which were uncontrolled, he noted, involved complex social interactions of an interpersonal nature. He briefly highlighted alterations made to the program in response to Lachenmeyer's propositions and indicated that efforts towards more effective operation of the program were continually being expended.

The problem really seemed to center around complex or subtle contingencies which, given the present stage of the development of contingency management techniques, seemed uncontrollable. However, it would be unrealistic

to expect the total management of all contingencies at this relatively early period in the history of operant conditioning as applied to complex human situations.

The success which has been claimed with regard to the application of operant conditioning principles in mass human situations has not been absolute and complete. Rather, success has been claimed over a wide variety of human situations, i.e. properly controlled learning situations. However, this article seemed important for the light it appeared to throw on the controversy about the effectiveness of the application of operant learning principles. It would seem to indicate that results could be abortive even given the high success rate in this area. Operant conditioning has not been presented as a miracle; it has been presented as a science. And in common with other realms of scientific knowledge its application in human life has seemed to be constantly expanding to new situations, constantly being shaped by varied unforeseen and sometimes problematic circumstances, while concurrently, new areas for research are being opened up.

It is to be noted here however that both Burchard and Lachenmeyer agreed that the problem would appear to lie with adequately controlling certain difficult contingencies. That is to say, they both had no bones to pick with the principles of operant conditioning, but with the

inconsistency with which the principles were being applied. Indeed the whole point of the claim about the success of operant learning, has been that the principles involved should be applied consistently and systematically.

The above problems would seem to make it essential for the principles to be properly understood before the techniques could be used. With proper understanding and experience it would be more feasible for difficult situations to be identified and handled with appropriate promptness and expertise.

What is true of operant learning principles as applied to residential retardates could also be true in the case of classroom learning.

Equally necessary then it would be for teachers to properly understand operant learning principles before they could start to use them effectively in classroom situations.

Gardner, Brust and Watson (1970) while observing that the use of behavior modification techniques with retarded populations was now commonplace, noted in their review that "few data are available concerning the methods of teaching behavior modification skills or evaluating the effectiveness of utilizing these skills." To this end they set forth to develop a scale which measured effectiveness in applying behavior modification skills to the treatment of the mentally retarded. This study

then would seem to recognize two things:

1. the need for applying the stated principles to the treatment of the mentally retarded, and

2. the need for effective training for the purpose.

The procedures referred to as behavior modification techniques were basically operant conditioning procedures requiring, therefore, a proper understanding of operant learning principles. Moreover, it was tentatively hypothesized that skill in using these techniques seemed controlled to a larger extent by cognitive variables than by attitudinal variables. This would seem to mean that it was indicated to the authors that the use of behavior modification techniques depended more on whether one had the skill (in the form of knowledge of the principles and procedures) than on how one felt towards behavior modification. This though tentative seemed a reasonable assumption. Thus, it would seem most essential to test the knowledge of those who should use these techniques. This study then agreed with the view of the present writer that in order to promote the application of operant conditioning principles in the educational setting, it must be ascertained how knowledgeable potential (or actual) users are about these learning principles. Hence, given the above evidence of the research which has pointed to the widely proven success of operant procedures in the classroom, it would appear reasonable to attempt to dis-

cover how knowledgeable teachers were about the principles underlying operant procedures. That is to say, could these principles be successfully or even reasonably applied in the classrooms on the basis of what teachers at present seemed to know about operant learning principles?

CHAPTER III

THE DESIGN OF THE STUDY

Construction of the Instrument

It was necessary to construct an instrument because the writer's search for a suitable scale for the purpose of this research proved fruitless. The available scales most closely related to the present study were specially designed for use in the area of mental retardation (Watson 1969, Gardner, Brust and Watson 1970). While these scales seemed suitable for evaluating efficiency in the knowledge and use of principles of behavior modification in the area of mental retardation, they seemed to have limited applicability in the broad area of evaluating teachers' understanding of operant learning principles as applied in the classroom at all levels of education and with various kinds of students.

Accordingly then the writer embarked on the task of constructing a scale that would serve the purpose of his study.

In the construction of this instrument the following steps were taken:

1. Textbooks and studies by notable scholars and researchers were overviewed in order

to determine topics and sub-topics usually considered in the area of operant conditioning (Appendix A). In addition, care was taken to distinguish between related topics which have sometimes been used interchangeably and might appear identical (example negative reinforcement and punishment). The implication of these distinctions would seem to be that a proper understanding of operant learning principles would require that certain concepts should, on the basis of their operational definition, be denoted separately. On the other hand, it was also necessary to introduce interchangeable terms in a manner that would test the individual's familiarity with the similar notions involved (example matching, imitation and modeling; successive approximation and shaping).

2. These topics and sub-topics were discussed with some senior graduate students, who have been exposed to this area in their university (graduate) education, to ensure relevance and accuracy.
3. It was considered that multiple-choice questions which could be answered on an

I.B.M. all-purpose answer sheet would be most convenient and objective for scoring. Thus a large number of multiple choice questions were drawn around each topic. The first battery consisted of one hundred and thirty items. Each item was assigned four alternative responses only one of which was right. The correct response was determined on the basis of the operational meaning of the term as well as certain well known experimental findings in relation to these topics (cf Honig, 1966). For example*, under the term "Extinction" one question would read:

The removal of reinforcement tends to:

(a) weaken an ongoing response and finally "stop" it.

(b) strengthen the expected response

(c) really do nothing to the ongoing or expected response

(d) destroy the "sensitiveness" of the respondent

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*Some of the items mentioned here, are samples of the types of concepts or issues which the investigator was considering. They do not necessarily represent the final form of the items used in the research. In fact, after several item analyses, many items were rephrased or discarded.

and another would read:

Extinction is the same as saying:

(a) a person forgets a behavior

(b) a person substitutes a behavior

(c) a person ceases to use a behavior

(d) a person improves his behavior

and yet another would read

Which of these steps would you take to extinguish a behavior that you do not approve of:

(a) withdraw any reinforcement

(b) provide an alternative

(c) give the child time to come to his senses

(d) punish the child if he does not change

Under the term "negative reinforcement," these would be a sample of the kinds of questions to be answered.

Which of these steps, assuming there were no others, would you take to promote learning if the problem was a dislike for an obviously dull textbook.

(a) set exams frequently on various sections in the book so the students have to read the book

(b) discard the book

(c) assume the judgement of the class is subject to the teacher's direction and proceed to teach the book cheerfully.

(d) tell the class the book has come to stay and stand no nonsense from them

When a teacher uses negative reinforcement, she has in other words:

(a) removed something unpleasant

(b) removed something pleasant

(c) applied something pleasant

(d) could be (b) or (c) but never (a)

Under "response heirarchies,"

In any learning situation, the operation of response heirarchies:

(a) should be considered

(b) should not be considered

(c) should be avoided

(d) should be denied

In which of these learning situations would response heirarchies be relevant:

(a) acquiring language

(b) deciding between studying Math and Social Studies

(c) deciding between studying and going to the show

(d) all of these

Under "Motivation"

Motivation refers to:

(a) factors which increase the vigor of activitiy

(b) factors which decrease the vigor of activity

(c) factors which determine the level of degree of activity

(d) none of these

One serious drawback in promoting the motivation of others is the problem of:

(a) locating adequate reinforcers

(b) providing incentives continually and consistently

(c) locating and eliminating all aversive factors

(d) channelling energies

All theories of motivation implicitly or explicitly refer to the central role of:

(a) deprivation and need reduction

(b) cognitive conflicts

(c) arousal and activation

(d) cortical and subcortical activity

Under "Generalization"

Which of these would you say illustrates learning:

(a) a child starts to cry at the sight of the white coated grocer

(b) a child starts to cry at the sight of the white coated dentist

(c) a child starts to cry at the sight of the white coated painter

(d) all of these

Generalization is a process

(a) by which we learn new things

(b) involving the emission of the same response in the presence of similar stimuli

(c) by which behavior can be shaped

(d) involving all of these

If a child says that adults are clever, it is an example of:

(a) day dreaming

(b) poor mentality

(c) parental "slackness"

(d) none of these

The object of presenting these types of items would primarily be to test proper understanding. Proper understanding refers to a knowledge of the basic definition of the term as well as the various ways the principle could be applied (especially in a classroom situation) and as well, recognizing erroneous concepts or notions popularly associated with these principles. To give two direct examples, (a) under "Successive Approximation," the question

The process of shaping behavior involves:

(a) reinforcing a general class of responses

(b) reinforcing responses approaching desired behavior

(c) both (a) and (b)

(d) neither (a) nor (b),

would aim at testing the individual's knowledge of the basic definition of successive approximation, and the question:

When a teacher or parent, reinforces behavior which is "near enough" to what he expects in the child, he is:

(a) shaping the child's behavior

(b) being lenient to the child's failure

(c) himself a lazy teacher

(d) "unshaping" the poor child even before the child has learned anything,

would seem to test the individual's understanding of how the principles might be applied; and the question,

To "wait for" the exact response or behavior you want from a child without providing any help for him:

(a) shows a relatively good understanding of learning principles

(b) shows a relative lack of understanding of learning principles

(c) is how learning is best fostered

(d) is a reasonable step to take ordinarily in learning,

would seem to test the individual's understanding regarding certain ways the principle might not be applied.

Under "punishment," the question

Punishment might be considered as characteristically

(a) anything painful to the child

(b) some painful experiences of the child

(c) anything the child avoids or attempts to escape from

(d) none of these,

would seem to probe for the generally accepted definition of "punishment" and the question

Punishment is:

(a) most effective at all times when a child does wrong

(b) most effective immediately after the undesired behavior

(c) not effective at any time

(d) most effective long after the undesired behavior

would seem to involve issues relating to biases regarding the use of punishment but which necessarily have no experimental support. The question

What punishment does, broadly speaking is:

(a) to effect correction or retribution

(b) to temporarily weaken established behavior

(c) to change the child for the better

(d) to strengthen established behavior and make it more likely on subsequent occasions.

incorporates some popular moralistic issues about punishment as well as some issues related to research conclusions.

4. This first battery constituted the large sample from which a tentative test was drawn. The author was assisted and directed here by a supervisor whose special teaching and research area involves behavioral principles underlying classroom teaching. The battery was then reduced to one hundred and three items via subjective assessment.

5. A further revision of the battery resulted from consultation with the supervisor, and extensive discussions with some senior graduate students. It was then reduced to ninety-one items.
6. This tentative battery was then ready for the first administration which was to provide a basis for item analysis.

The Initial Form

The test was administered to various samples of teachers, student teachers and non-teachers. The tabulation below (Table 1) shows how the samples were drawn.

No time limit was stipulated and subjects were requested to attempt every item. It was impracticable to administer the test to all samples simultaneously. But the conditions under which various samples did the test were, to a relatively high degree, uniform. In order to ensure maximum security measures against contamination of the answers from the various groups by others, the test was collected from the subjects at the end of the testing period. Care was taken to avoid answering questions from subjects which related to "the right" or "the wrong" answer to an item. It was necessary to do this to reduce the probability of a retesting being contaminated by "feedback" from earlier

testing.

In almost all cases there were discussions after the testing, aimed at providing face validity and at obtaining some indication of what motivational conditions affected the testing.

It was quite clear from various comments that most subjects were unfamiliar with the actual scientific definition of most of the terms though they somehow realized what the point of the item was. Frequent references were made to the length of the test (i.e. the number of items in the test). The impression was conveyed that while the number of items did not affect the choice of the responses, there was a risk of non-completion if a subject worked through slowly or if only a limited time was available for the testing. Since this was a test which had a definite right or wrong answer it was deemed expedient that it had to be done under supervision. Accordingly, the tester noted that the most important aspect of the test to be modified was the number of items so that time restraints would not be necessary. Secondly, the most difficult items were to be deleted.

TABLE I

DISTRIBUTION OF INITIAL SAMPLE

	Category	No.	Category	No.	Category	No.	Category	No.	Total
Student Teachers	Educational Psychology	14	Elementary & Secondary Education (various majors)	7	Sociology & Anthropology majors	10			31
Teachers	Elementary	31	Senior High & Junior high	56	Special Education including pre school	3	Not identified	35	126
Non Teachers	Professional	15	Non Professional including housewives	7	Not identified	11			33

Gross Total	190
Rejected by machine *	9
Total used for item analysis	181

* 2 from elementary teachers
6 from unidentified teachers
1 from non-professional people

Item Analysis

The computation whereby item analysis data were derived was done by machine (IBM 360/67 using the Kuder-Richardson formula--K-R 20.

Description

This program, performed an item analysis on a multiple choice type of test data operating on a one (for a correct response according to the key) or a zero (for the incorrect response) pattern. Such data could be coded either through a manually key punching devise or, as in the case of the present data, through the IBM--1230 optical test scorer.

The output by the program which was significant for the operation of item selection in the present test were as follows:

(a) Frequency distribution, normalized Z scores, cumulative percentages

(b) Histogram

(c) Test statistics which included a K-R reliability, a test mean, a test variance, a critical mean, a critical variance and a detailed item-by-item analysis which provided among other indices (i) difficulty index; (ii) biserial correlation and (iii) the item reliability index.

The statistics were as follows:

Test mean 50.24

Test variance 75.21

KR-20 Reliability 0.77

Item Selection I--Rationale for Item Selection and Rejection

The total data were considered in determining which items were to be discarded, modified or retained. But it was regarded as particularly important to pay close attention to the item difficulty index and biserial correlation coefficient (cf. Davis in Ebel p. 346). The former, being the index of difficulty, provided information relating to the level of difficulty of an item in proportion to the percentage of people who passed the item. But then, a difficult item which is of the nature of a scientific definition would be expected to identify those subjects who knew about the topic--however few they may be and those who did not--however large the number. An item in which no subject was right would still be useful for just that purpose that is, to discover whether anybody knows the answer to that question i.e. anybody in the tentative sample (Popham and Husek 1969). The assumption here is that the tester knows the answer or knows that there is a correct answer. The crucial underlying problem would be that of differentiating between those items which were wrongly answered because they were too difficult and those wrongly answered because the

wording of the item was misleading or ambiguous.

Accordingly, the tester devised 'criterion groups,' designated "bright" and "dull" on the basis of which certain items would be evaluated as being 'too easy' or 'too difficult'--i.e. requiring elimination (Table 2).

TABLE 2

Criterion Groups and Associated Degree of Difficulty Requiring Elimination of Items

Criterion	No. of subjects	Range of responses answered correctly	Average group passing (40-60%)	
Bottom 27%-- "Dull"	5	0 - 30	2 - 3 subjects	more than 3 = 'too easy'
Top 73% "Bright"	25	60 - 91	10-15 subjects	Less than 10 = 'too difficult'

Thus, a difficult item was considered in the light of the percentage of "bright" subjects who passed it. A subject whose score was 73 percent of the maximum obtainable was designated "bright". If less than an average range (i.e. 60-40 percent) of subjects in this category passed, then the item is considered difficult and would be eliminated. On the other hand if more than an average number of subjects in the "dull" group passed on an easy item, the item would be considered too easy and dropped. A subject whose

score was twenty-seven percent of the maximum was designated "dull." An index around .5 is usually considered to represent an average difficulty level (Gulliksen, p. 374, Lindquist p. 308f, p. 596). Thus a range of .40 - .60 was adopted in this study. The above procedure was used to ensure that there was a wider spread of difficult and easy items beyond the average difficulty range. However, because the test was designed to distinguish between subjects who know about operant principles and some of the research involved, and those who did not know, the difficulty per se of the items was not a crucial matter. The above steps were taken in order to ensure a relatively objective evaluation of items which could be useful in discriminating within the extremes of the experimental samples.

The other important index was the biserial correlation coefficient. This was the discrimination index--the basis on which an item was regarded as having capacity to distinguish between those who knew about the topic and those who did not. Thus the maximum discrimination an item could indicate would be reflected in the fact that the top twenty-seven percent of the sample was entirely correct in the item whereas the

bottom twenty-seven percent would be entirely wrong (cf. Macintosh and Morrison 1969, p. 63). The biserial correlation here would be represented by the integer 1.00. This, in other words, meant perfect discrimination.

A good item has been described among other things as one having a "sufficiently high discrimination." The index of discrimination has been explained by various people (e.g. Thorndike and Hagen, 1969; Davies, in Lindquist, 1951) as however a matter depending on such factors as the type of material tested, the type of sample on which the material was to be tested--i.e. the range of ability of the subjects. The issue relating to the optimum size of the biserial correlation coefficient should be one which the tester must decide for himself taking into consideration especially the purpose of his test. All the same, some reasonable figures have been proposed which could be used with tests of the kind now being considered. Ebel (1965), and Engehhart (in Mehrens and Ebel 1967) suggested that an index of 0.30 would be the minimum required for adequate discrimination. Macintosh and Morrison (1969) suggested that 0.40 and above would be most adequate, but that 0.30 to 0.39 could be reasonable though some improvement of the item would be required. They considered that 0.20 to 0.29 would represent marginal discrimination and an item in this cate-

gory would require major revision. Any item with an index below 0.2 "must be rejected as being completely unsuitable"; and the same treatment was suggested for items "with a negative discrimination index..." (p.66). Davis (in Lindquist p. 306-307) suggested however that "an item should never be subjected to revision that destroys its point." He pointed out that whereas an item might not prove discriminative in an initial sample, it might eventually prove very useful for specialized purposes (e.g. differentiating between the very best and all the others or the least capable and all the others.) Finally, Gulliksen cautions that the "judgement of the subject matter expert must always play an important part in the selection and rejection of items for an achievement test" (p.365).

In view of these considerations, especially the last two, the tester believed that since the groups he would be dealing with in actual testing could hypothetically, but conceivably, be differentiated into most capable (example subjects among student teachers) and least capable (example, subjects among non-teachers) and since this present test was an achievement type test in which the opinion of subject matter experts served as a check, a biserial correlation coefficient of .20 (though marginal) would be useful.

Accordingly, then, the test constructor embarked

on the task of selecting suitable items for the final testing assisted by the procedures referred to above (see especially Table 2 and Appendix C).

Item Selection II--Which Items were Accepted or Rejected

The biserial correlation was considered firstly and then the difficulty level was made a complementary factor in determining suitable items (cf. Ebel p. 354). On the basis of the biserial correlation then twenty-five items were clearly rejectable since their biserial correlation was below .20. The remaining items were therefore considered as having adequate discriminative capacity. Further screening then utilized the index of difficulty. As stated above, an item of more than sixty percent difficulty level or less than forty percent difficulty level was considered as tending to be 'too easy' or 'too difficult' for the sample. These items were considered in the light of the responses of those in the "bright" and "dull" group respectively. This procedure resulted in the elimination of a further four items, three of which were considered as too difficult and one as too easy. Thus, a total of twenty-nine items were rejected leaving sixty-two as appropriate items to test understanding of operant learning principles with a second sample.

The rejection of certain items, however, created an imbalance in the content areas represented in the test, by the fact of one sub-topic (negative reinforcement) being entirely eliminated.

Thus, it became necessary to construct other items in this area which would be tested on a similar sample as the above. These would be further screened and incorporated in the parent test, which would be retested as a battery, on another sample to finally establish the test's reliability.

Item Selection III--Negative Reinforcement

In order to replace those questions under Negative Reinforcement which were eliminated through item analysis, a small battery of twelve items was constructed which contained only material concerned with Negative Reinforcement. It was hoped that out of these a minimum of three or four items would be found suitable to include in the larger battery. The same procedure was used in constructing these items as was used with the parent test. Some items required a basic knowledge of the operational definition of Negative Reinforcement. Example

> It is a common expectation, described in technical language as negative reinforcement to:
>
> (a) avoid or escape from unpleasant or aversive circumstances

(b) consider alternatives in the light of prevailing conditions.

(c) use force in unpleasant or aversive circumstances

(d) calmly consider alternative actions and choose the least aggressive

Other items sought to discover whether the subject knew how the principle in question could be applied in any learning situation; especially in classroom learning. Example

Every now and then a child meets with difficulties with which his teacher is familiar. The child will be rewarded if the teacher:

(a) shows him how to avoid difficulty

(b) helps him out of the difficulty

(c) clearly demonstrates that such difficulties can be avoided

(d) does any one of the above.

And others were aimed at discovering whether the subject was aware of some of the factors involved in the application of this principle, distinguishable from erroneous popular thinking. Example

To punish a child so he will stop a 'bad' behavior

(a) provides an example of cruelty

(b) makes the rest of the class happy

(c) may produce reinforcement for the teacher

(d) makes subsequent behavior control ineffective

This battery was tested on a group of forty-one people which comprised teachers, student teachers and non-

teachers. A summary of the distribution of persons in the three groups is given in Table 3.

An item analysis was performed, following this administration. All the print-out data (except the test reliability coefficient) was used in this analysis but the biserial correlation and the item difficulty index were considered as the most relevant indices to determine which items should be accepted rejected or ammended. On the basis of these (see Appendix D) three items (3, 11 and 12) were selected to be retained with slight modifications. This selection was made on the basis of their high biserial correlation (since the closer this approached 1.00 the more discriminating the item was considered to be, all other things being equal) as well as an adequate item difficulty index. Some items with a high biserial correlation and an acceptable difficulty level were rejected because some distractors were too poor, and a major ammendment would be necessary if the item was to be retained. Since such modifications however would result in virtually new items, it was considered reasonable to reject them because the resultant modificd items would not be the same for which the item analysis indices were originally computed.

The three items thus chosen were incorporated into the parent test, to take the place of those which were eliminated under Negative Reinforcement.

Table 3

Distribution of Negative Reinforcement Sample

Type of Subject	Number in each group
Teacher	13
Student-Teacher	20
Non-Teacher	8
Total	41

Reliability and Validity

As indicated earlier, the item analysis test among other data provided a test reliability value, computed from one of the Kuder-Richardson reliability formulas. The KR-20 reliability of the original ninety-one--item test was 0.77.

After the unsuitable items had been rejected and the items on Negative Reinforcement included, the K-R 20 reliability figure was .80 with a total number of eighty-five subjects.

In the case of validity, the following procedures were followed:

Content Validity. This was established by firstly consulting relevant text books on the subject, or which have useful references to behavioral principles

of learning especially as applicable to classroom situations (example Reese, 1966; Honig, 1966; De Cecco, 1968; Staats,1968; Staats & Staats, 1966; Verhave, 1966; Lundin, 1969; Bandura and Walters, 1963; Bandura, 1969; Tharp and Wetzel,1969; Meacham and Wiesen, 1969; Buckley and Walker,1970; Mink,1968). Secondly, a run through of the test was done by the investigator's supervisor who has appreciable experience in teaching these principles, is keenly interested in behavior modification especially in the classroom and has assisted other students in numerous situations with similar problems. Another professor, experienced in the theory and practice of behavioral principles independently edited and evaluated the test. Also, some senior students who have themselves had experience with operant principles (and test construction) further established the test's content validity.

Concurrent Validity. This was established by comparing the results on the test of students in the area of learning who had just completed a course in learning theory, with those who had never been taught these principles.

The students who took part in the course in learning theory included candidates for both the Master of Education and the Doctor of Education degrees. These graduate students had a good background in educational

psychology. The course was for half a year and involved theoretical and practical issues in the area of learning theory. This included the concepts and principles of operant conditioning. The other group with which the above group was compared, consisted of students who had had no previous instruction in learning theory or operant conditioning, in particular. These individuals were obtained from the departments of English and Sociology. The method used to compare the two groups was to apply a t test (Anova 10). Among other things, this form of the test (i.e. Anova 10) indicated whether the two groups could be expected to be derived from the same population of students, in respect to the operant principles test. The following was the result of the t test.

Table 4

T-Test of a Group with Instruction and a Group Without Instruction in Operant Learning Principles (Learning Theory)

	N	Mean Score	Std. Dev.	DF	Obtained t value	Critical t value for .01
Group 1 (Instructed in Operant Principles	18	55.39	4.35	34	13.817	2.445
Group (not instructed in O.P.	18	33.8	4.99			
Total	36	44.61	4.67			

The above table shows that there was a considerable difference in terms of mean scores between the two groups. Quite clearly the group which had received instruction in operant learning principles achieved a much higher mean score than the group which had not received this instruction. The above analysis served to demonstrate that the Operant Principles Test had the capacity to discriminate between people who were supposed to have an understanding of operant principles of learning and those who were not. This would seem to provide the test with concurrent validity.

Construct Validity. Strictly speaking this type of validity was not necessary for this test. Being an achievement type test it dealt with proficiency in a specified content area--namely, S-R principles of learning, and especially operant conditioning principles. Operational definitions however were verified through procedures already explained in connection with content and concurrent validity.

Face Validity. The usefulness of face validity in test construction was recognized very clearly in initial test construction phases. Some comments by people outside the area of learning theory regarding the esoteric nature of the test instigated a rephrasing and reconstructing of some test items. But more important

these evaluative comments by some subjects served to confirm that the test did have the characteristics of testing a special area of knowledge.

Another outcome of the observations of various subjects was a further shortening of the test. It seemed realistic to believe that if a subject considered a questionnaire too long, it might affect his motivation to attend conscientiously to the testing and therefore affect his choice of distractors. Since in any case a pre-determined length was not a requirement of the investigation, the test was shortened. The method used to shorten the test was basically to divide the test into alternate forms, to obtain a more and a less efficient part. The more efficient part contained those items which had better discriminative and difficulty indices whereas the less efficient part contained the same kinds of items which had lower biserial correlation coefficients and item difficulty indices. The more efficient form of the test constituted the final form. There were thirty-six items in the final form.

This final test was administered to the experimental sample and a K-R reliability computed. The K-R reliability coefficient was .73. According to Ebel's explanation of the relationship between the number of items in a test and the reliability coefficient of that test (Ebel, 1965, p. 336f) a longer test should have a

higher reliability than a shorter test. It was therefore not surprising that the shortened form of the present test produced a slightly lower reliability coefficient than the longer form.

As in the case of the longer test, a comparison was made between the performance of students in a behavior modification seminar and that of individuals who had had no instruction in the area of behavior modification. The seminar involved the theory and practice of using reinforcement learning theory to effect changes in behavior. The students in this seminar had to complete, apart from reading assignments, a formal project in which the principles of learning theory were applied. The test was administered at the end of the course. The following was the result of the comparison obtained by means of a t test.

Table 5

T-Test of a Group with Instruction and a Group Without Instruction in Operant Learning Principles (Behavior Modification)

	N	Mean Score	Std. Dev.	DF	Obtained t score	Critical t score for .01
Group 1 (Instructed in O.P.	10	27.0	4.80	18	9.371	2.552
Group 2 (Not instructed in O.P.)	10	8.0	4.20			
Total	20	17.5	4.50			

Table 5 shows a significant difference in mean score performance between students who had been instructed in operant principles of learning and those who had not been. The former group performed much better than the latter group. This meant that the shortened form of the Operant Principles Test was capable of discriminating between individuals who were supposed to have an understanding of operant learning principles and individuals who were not supposed to have this understanding. This then, would seem to demonstrate that the final form of the test had concurrent validity.

The Sample

The sample consisted of three major groups:

1. Teachers
2. Student Teachers
3. Non-Teachers

All three samples were given the Operant Learning Principles Test to find out what they know about learning principles as applied in the classroom.

Teachers

The group designated as teachers was derived from two school systems in the city of Edmonton. These were the Public School System and the Separate School System. Both sections of this sample were derived by assignment. That is to say, the education authority involved, assigned to the experimenter certain schools

in its system, on the basis of size and availability of time. The schools from the Public School System were mostly in a new development middle class area. Most of them were new schools with mostly young teachers. The schools from the Separate School System were assigned such that they did not fall into any particular geographical or socio-economic cluster.

Five schools, comprising two elementary, one junior high and two composite high schools, were in all, tested in the Public School System. Three schools comprising two junior high schools and one composite high school, were in all, tested in the Separate School System.

Since these schools were not chosen with any distinguishing teacher characteristics in mind, the teachers in this sample did not have any special qualities relative to the purpose of the experiment. The criterion for the choice of this sample was that they should be teachers recognized by the Education Act concurrently in force.

Student Teachers

This sample group was entirely from the University of Alberta from which by far the largest proportion of intake into the teaching force of Edmonton is obtained. They included students who were training for an elementary school teaching career and students training for a

secondary school teaching career. They represented various subject or curriculum area specialists at various stages in their preparation program. The criterion for choosing this group was that they should be registered in a teacher training program which was taken as an officially expressed intention to become teachers. All the students in this group were registered either in the Bachelor of Education program or had completed their B.A. and doing an M.Ed. The latter formed a very small proportion of the sample.

Non-Teachers

This group comprised persons from different walks of life, who had never been to University and who were not teachers. In other words this sample group attempted to account for the rest of the general population excluding teachers and student teachers. They were derived from a number of occupational and semi-professional areas of society. Although this sample could not be strictly described as randomly selected at least a small percentage was (about 30 people). The rest were obtained through agencies and training or preparation programs.

Table 6

Categories of the Experimental Sample

5 Public Schools	96
3 Separate Schools	60
Total in Teachers' Group	156

6:1 Teachers According to School System

Student teachers in Elementary Education	90
Student teachers in Secondary Education	40
Total in Student Teachers' Group	130

6:2 Student Teachers according to Major Area

Non degree Nurses in a training program	34
Non degree trained nurses	14
Motor mechanics (in training)	24
Mixed professions (training program)	30
Housewives and trained professionals	32
Adults in updating education program	33
Total in Non teacher group	167

6:3 Non Teachers according to Professions

Table 6 (Continued)

Teachers	156
Student Teachers	130
Non Teachers	167

6:4 Total Number of Entire Sample--453

Analysis of the Data

The data were analyzed for differences between subgroups on their mean scores from the Operant Principles Test (O.P.T.) According to the hypotheses it was expected that there would be no difference in understanding of Operant principles as tested by the O.P.T., between teachers and non-teachers and between teachers and student teachers. The analysis therefore involved a simultaneous comparison of test performance scores of teachers, student teachers and non-teachers. The method was a one-way analysis of variance (Anova 15).

Another analysis was performed on the data to test for differences in test performance between males and females. While this latter analysis was not strictly necessary to the point of the study, it was considered an interesting point to see what the sex grouping of the sample would indicate. The method used here was also a one-way analysis of variance (Anova 15).

A third analysis performed on the data was intended to discover any differences in test performance, between teachers grouped according to school system (i.e. Public school teachers and Separate school teachers). Again the analysis was not strictly required by the purpose of the study. The purpose of the study was to find out what teachers knew about operant learning principles, (as compared with student teachers and various people in the general public) irrespective of their sex, or place of work. However testing for sex differences has become standard in experimental literature and testing of differences in school systems might indicate the presence of certain influential variables. A one-way analysis of variance (Anova 15) was then performed on the data to test for differences in test performance between teachers of the two school systems.

The experimental samples however contained in some cases grossly disproportionate sizes. Box (in Winer p. 93) has warned that this could create a bias in the resulting test. Accordingly the sample sizes were reduced by a selection which involved the assigning of random numbers (cf. Ferguson p.133). Test runs of random samples from within each group provided information which indicated that these samples were from the same sub-population. Thus,the final tested sample

groups were as follows:

Table 7

The Experimental Sample according to Treatment Categories

Category	Size of Sample
Teachers	135
Student Teachers	130
Non Teachers	138
Total	403
Public School Board Teachers	43
Separate School Board Teachers	39
Total	82
Male	60
Female	62
Total	122

CHAPTER IV

RESULTS

The results which are presented in this chapter involve firstly an explanation followed by the tables from which these outcomes are interpreted. In each case there are three outcomes which correspond to three tabulated representations. That is to say, the steps in the experimental treatment of the groups involved three phases--firstly, the computation of mean scores, standard deviations and variances; secondly, an analysis of variance and, thirdly, a Newman-Keuls comparison between ordered means. In the first phase, indications are given of a difference or similarity in performance between the groups which were being compared; in the second, the analysis of variance determines to what extent the indicated difference or similarity could be said to be actual or merely apparent; and finally the Newman-Keuls comparison points out specifically where the difference or similarity lies.

Table 8 (i.e. 8:1, 8:2, 8:3) deals with the performance of teachers, student teachers and non-teachers on the Operant Principles Test. The sample sizes, mean scores, variances, and standard deviations are given respectively in table 8:1. This table shows differences in

mean scores among the three groups. To discover whether the observed differences among these mean scores were significant, an analysis of variance was performed (table 8:2).

It is clear from the last two columns of table 8:2 that there were significant differences between teachers, student teachers and non-teachers in their performance on the Operant Principles Test. However the analysis of variance test indicated only an overall difference. In order to find out how this overall difference affected the individual groups a Newman-Keuls comparison between ordered means was performed (table 8:3).

Table 8:3 sets out the means of the three groups for statistical comparison. This method of comparing means made it possible for the groups to be compared two at a time. The three statements following table 8:3 respectively describe the results of the comparison in statistical terms. According to table 8:3 the observed difference between groups one and three (i.e. teachers and non-teachers) was 4.052. According to statement (a), the critical value should be 1.413. The hypothesis then which stated that there was no difference between teachers and non teachers on their understanding of operant learning principles was rejected. Since the mean score of teachers was higher than that of non

teachers, it may be assumed that teachers were more knowledgeable in operant learning principles than non-teachers. The comparison between teachers and student teachers showed that there were no significant differences (i.e. the obtained value, 0.187, was less than the critical value, 1.082). This meant that teachers were just as knowledgeable as student teachers about operant learning principles. Thus the hypothesis, [statement (b)] which stated that there was no difference in their knowledge, should be accepted. Student teachers were found to be significantly different from non-teachers, according to the Newman-Keuls comparison (obtained value, 3.865, critical value, 1.182). Thus the hypothesis which stated, [cf (c)] that there was no difference in their understanding of operant learning principles should be rejected. As could be seen from table 8:1, student teachers achieved a higher mean score than non-teachers. This indicated that student teachers were significantly more knowledgeable about operant principles than non-teachers.

Table 8:1

Teachers, Student Teachers and Non Teachers

Category	Sample Size	Mean	Variance	Std. Deviation
Teachers	135	21.7407	21.4772	4.6343
Student Teachers	130	21.5538	21.2884	4.6139
Non Teachers	138	17.6884	30.5375	5.5261
Total	403	20.2928	27.8748	5.2797

Table 8:2

Analysis of Variance

Source of Variance	SS	MS	DF	F	$F_{.95}$
Group	0.14258125E 04	712.91	2	29.08	3.02
Error	0.98076875E 04	24.52	400		

Table 8:3

Newman-Keuls Comparison between Ordered Means

Groups		Means	1	2	3
			21.741	21.554	17.688
Non Teachers	3	17.688	4.052	3.865	0.0
Student Teachers	2	21.554	0.187	0.0	
Teachers	1	21.741	0.0		

R = 3 2

The multiplier is 0.42736

(a) The critical .05 value (using the studentized range statistic for 3,400) is, 3.31 (.42736) = 1.413. Obtained value = 4.052. Therefore Ho $\mu_1 = \mu_3$ is rejected.

(b) The critical .05 value for 2,401 is 2.77 (.42736) = 1.182. Obtained value = 3.865.

Therefore Ho $\mu_1 = \mu_2$ is accepted.

(c) The critical .05 value for 3,401 is 2.77 (.42736) = 1.182

Therefore Ho $\mu_2 = \mu_3$ is rejected.

The following tables (9:1, 9:2, 9:3) present the results of the performance of male subjects and female subjects. The first table (9:1) records the sample sizes, mean scores, variances and standard deviations of both groups. The second table (9:2) shows the results of an analysis of variance which was performed on these two groups to discover whether there

was any significant difference between the mean scores of males and females. It was found, as stated in the last two columns of the table, that the obtained value (6.60) was higher than the critical value (2.92). This indicated that the two groups were significantly different from each other. This difference was further confirmed by the Newman-Keuls comparison of ordered means (table 9:3). The statements which follow the table describe this difference in statistical terms. According to the last statement, it could not be maintained that males and females were similar in their performance on the Operant Principles Test. Thus the hypothesis which stated that there was no difference between males and females in their knowledge of operant learning principles should be rejected. It would seem from the mean scores of these two groups (table 9:1) that females were more knowledgeable in these principles than males.

Table 9:1

Sex Differences

Category	Sample Size	Mean	Variance	Std. Deviation
Male	60	18.4000	29.1935	5.4031
Female	62	20.9355	30.1931	5.4948
	122	19.6885	30.8213	5.5517

Table 9:2

Analysis of Variance

Source of Variance	SS	MS	DF	F	$F_{.95}$
Groups	0.19601953E 03	196.02	1	6.60	
Error	0.35641445E 04	29.70	120		3.92

Table 9:3

Newman-Keuls Comparison between Ordered Means

Groups		Means	2	1
			20.935	18.400
Male	1	18.400	2.535	0.0
Female	2	20.935	0.0	

R = 2
The Multiplier is 0.69788

The critical .05 value (using the studentized range statistic) for 2,120 is 2.80 (.69788)
= 1.954. Obtained value = 2.535
Therefore Ho $\mu_1 = \mu_2$ is rejected.

Table 10 (i.e. 10:1, 10:2, 10:3) presents the results of comparing the performance of teachers in the Public School System with that of teachers in the Separate School System. Again the first table (10:1)

provides sample sizes, mean scores, variances and standard deviations respectively. It would seem from this table that the mean scores of both groups were very similar. To discover whether there were no statistical differences, concealed in the apparent similarity of the mean scores, an analysis of variance was performed. This revealed (table 10:2) that no statistically significant differences could be said to exist (i.e. the obtained score was much lower than the critical value). Again a Newman-Keuls comparison was made between the two groups (table 10:3) and no differences were seen to exist. This meant, as stated in statistical terms (under table 10:3) that the hypothesis should be accepted which stated that teachers in the Public School System and teachers in the Separate School System were equally knowledgeable about operant learning principles.

Table 10:1

School System Differences

Category	Size of Sample	Mean	Variance	Std. Deviation
Public School Teachers	43	21.5116	26.8275	5.1795
Separate School Teachers	39	21.2308	21.0775	4.5910
Total	82	21.3780	23.5283	4.8506

Table 10:2

Analysis of Variance

Source of Variance	SS	MS	DF	F	$F_{.95}$
Groups	0.16093750E 01	1.61	1	0.07	3.96
Error	0.19296719E 04	24.10	80		

Table 10:3

Newman-Keuls Comparison Between Ordered Means

Groups	Means	1	2
		21.512	2.231
2	21.231	0.281	0.0
1	21.512	0.0	

R = 2

The Multiplier is 0.76753

The critical .05 value (using the studentized range statistic) is 2.82 (.76753) - 2.1714
Obtained value = 0.281.
Therefore Ho $\mu_1 = \mu_2$ is accepted.

To sum up then, the tabulated results indicated the following:

1. That there was an overall difference between teachers, student teachers and non-teachers significant beyond the .05 level of significance. Comparing the means of these

three groups two at a time, however, it seemed that this overall difference was produced largely by the difference of the third group (non-teachers) from the rest. The Newman- Keuls comparison, then, showed that there was no statistically significant difference between teachers and student teachers on the Operant Principles Test, but that there was a difference between teachers and non-teachers and between student teachers and non-teachers. Teachers and student teachers appeared to have a better understanding of operant learning principles than non-teachers.

2. Both on the critical F ratio and the Newman-Kuels comparison, there was a significant difference between males and females in their knowledge of Operant Principles as tested by the Operant Principles Test. Females appeared more knowledgeable than males.

3. There was no overall difference between teachers employed by the Public School Board and teachers employed by the Separate School Board. The Newman-Keuls comparison also showed no significant differences between these two groups.

CHAPTER V

DISCUSSION

A. Discussion of Results

The hypotheses (p.3) embodied the anticipation that there would be no difference in their understanding of operant principles, between teachers and non-teachers and between student teachers and non-teachers as well as between teachers and student teachers. In two out of the three cases which were verified through actual observation, the hypotheses were not confirmed. That is to say, the expectation of no difference in two cases, proved invalid. Thus the data which were used to compare teachers with non-teachers indicated that teachers knew significantly more about operant learning principles than did non-teachers. The data also indicated that student teachers knew significantly more about these principles than did non-teachers. And finally the data revealed that neither teachers nor student teachers knew significantly more than the other about the principles of learning involved in the Operant Principles Test.

The immediate conclusions to be drawn from these results seem to be that training for the teaching profession does make a difference in regard to knowledge

of certain objective principles (i.e. operant principles). The old view that anybody could teach a subject effectively, once the content of that subject had been mastered, would have to be modified. Mastery of certain learning principles (e.g. operant learning principles) would seem, as indicated in the literature, to be essential for effective teaching. On the basis of the present study non-teachers knew less about operant principles than teachers and student teachers. Non-teachers would therefore not be expected to be as effective in the classroom, as teachers who were already in the profession or student teachers who were being trained as teachers.

The other tests for significant differences which were not considered relevant to the purposes of this study but which were performed as an interesting exercise produced some instructive results. It was observed that males and females showed a significant difference on their performance on the Operant Principles Test. This difference could be explained in terms of established sex differences in certain abilities. Broverman et al. (1968) discuss the cognitive superiority of females over males in regard to simple perceptual motor tasks, such as those which require "rapid perception of details and frequent shifts of attention" (p. 24). Both in this article and in another (Broverman et al. 1969) simple perceptual motor tasks are explained as referring, among other things, to verbal and reading abilities. The Operant Principles Test was an objective test involving the use of a separate machine-scorable answer sheet.

As such not only were subjects required to use reading abilities, the test being verbal, they were also required to shift their attention to and fro, quickly, between questionnaire and answer sheet, while at the same time utilizing "small muscle movements" to shade-in answers (cf. Broverman et al. 1968, p. 25). This finding in our present study could in fact mean further evidence in support of the already established issue. But this statement cannot be made with confidence because the study was not designed to investigate this phenomenon. However, it might be useful to embark on such an investigation and properly control for content of knowledge while testing for sex differences in perceptual motor coordination and association in regard to the kinds of responses involved in reading a questionnaire or test and putting answers on a separate sheet. Since mechanized examinations are now common practice in the schools such an investigation could provide information which will help teachers and administrators to understand better, certain differences in the performance of male and female students.

For the purposes of the present study however, it is sufficient to state that the observed sex difference has been demonstrated as characteristic of tasks akin to the answering of the Operant Principles Test.

In the case of the no difference finding between the Public School Board teachers and the Separate School Board Teachers, one would hardly consider the result unexpected. The teachers who enter who enter the two systems are derived largely from a common source (i.e. The Faculty of Education, University of Alberta) and as such

have been exposed to relatively similar training programs. The results then provide reassuring evidence of a comparable teaching competence in both systems, in regard to their understanding of operant learning principles.

B. Teacher Preparation in relation to the learning of children

One of the major purposes of the study was to discover how knowledgeable practising teachers were about behavioral learning principles which could be used to improve the learning of children. The point of this was to raise the question of the practicability of implementing the consistent use of behavioral learning principles in the classroom given the degree of success attributed to S-R techniques when used in the classroom. The study points out that expecting teachers to use operant principles of learning successfully in the classroom on the basis of their present knowledge is probably unrealistic. Comparing the mean score of teachers with that of students who were specially taught the principles of operant learning it was found that the mean score of teachers was much less than that of the instructed students (Teachers = 21.74; students in the Behavior Modification class = 28.4 out of a possible 36 points.)

Becker et al. (1969) recommended that certain complex token reinforcement programs are done under the supervision of "someone well-versed in behavioral analysis" (p.28). Knowles et al. (1969) also concluded that "in order to insure the successful introduction and continued use of the demonstrated usefulness of behavior modification techniques, qualified personnel must be available" (p. 94). In their study, "How to Make a Token System Fail," Kuypers, Becker and O'Leary (1968) refer to the importance of "training in the systematic application of behavioral principles." This helps the teacher to know "how to shape behavior and how to effectively use differential social reinforcement."

These implications of previous research apply very clearly to the findings of this study. It will be unrealistic to expect teachers to apply these principles consistently and effectively because they are not well grounded in their understanding of these principles. In most of the studies reviewed earlier, the high degree of success could be partly attributable to the fact that researchers or sometimes their assistants were well trained in behavioral principles. The effectiveness of S-R principles (including operant learning principles) seems to rest on the consistency with which these basic principles are applied. Conversely, some of these studies reported problems and

less-than-excellent results whenever there were deviations from consistent adherence to required operant procedures. In some cases (e.g. Burchard 1969) it was admitted that certain contingencies were by their nature difficult to control. No doubt, the prerequisite in such problematic instances seems to be a proper understanding of the principles involved. The performance of teachers on the Operant Principles Test as compared with non teachers on the one hand, and students of behavior modification on the other, provides a clear indication that Teachers need proper instruction in Operant Learning principles before they can become effective operant conditioners of the learning behaviors of children. The study however reveals that the present teaching force, of which the experimental sample was representative, is a very appropriate group to instruct to use operant principles in the classroom. Not only are they already relatively acquainted with these principles, but as well have had the profit of exposure to the actual behavior and academic problems towards which operant principles are directed. As such they have a practical operational basis, in vivo, which is necessary to buttress the theoretical understanding of these principles.

The above discussion is not to mean that teachers in preparation (i.e. student teachers) have no need for further training in operant principles. Our statistical

analyses have shown that student teachers and teachers are not significantly different from each other. Compared with students instructed in these principles, student teachers also appear to have a relatively smaller understanding of the principles in question. This would seem to indicate that for operant learning principles to be applied successfully, and effectively, in the classroom by student teachers, given their present state of knowledge, it would be necessary for them to have more instruction and training in the area. So then an assessment of the effectiveness of operant procedures in the classroom based on the present general teacher and student teacher population would not be valid, if previous special training had not provided a proper understanding of operant principles of learning. Some previous studies provide examples of evaluations of the effectiveness of operant techniques in the absence of any investigation of the users' knowledge of the basic principles involved. Vogler and Martin (1969) for example referred to programs erroneously labelled "Operant Conditioning" which were implemented by people "who are essentially ignorant of the principles of operant conditioning..." (p.60). These writers further defended the use of operant techniques by appealing to the competence of the user. This appeal to competence is a crucial issue in the growing use of operant and

other S-R techniques in education and therapy. Schaefer (1969) in his defense of the use of deprivation also refers to the presumed competence of the user of (aversive) operant techniques. In the medical context in which these appeals were made, they may be deemed genuine. In the world of education however, especially in the classroom an assumption of competence cannot be made as in the above instances. In the classroom context it is necessary for an investigation to be made into teachers understanding of these principles. The results of this study have indicated that competence in operant techniques cannot be assumed for the present population of teachers and student teachers. For competence to be ascribed, one would expect a much greater significant difference between these two groups and the ordinary population, and a much closer similarity between their mean score and that of students instructed in behavior modification principles.

A second question which this study intended to deal with was reasons for the absence of a widespread use of operant techniques in the classrooms given the widely demonstrated effectiveness of their application. A final reason from this study would be premature. However it seems suggested by the relatively small margin of difference between the knowledge of the ordinary population about operant principles and that of teachers and student teachers that teachers and student teachers

would not feel confident in applying principles they did not properly understand. Since presumably their competence was in question it was probably best to avoid implementing operant techniques. However as the review of relevant literature indicates, those teachers who were specially instructed in operant principles of learning proved to be very effective users (e.g. Hall et al. 1968) and their success with social and academic problems was remarkable. The issue of competence in the application of operant principles becomes very urgent in view of certain unavoidable consequences. Becker et al. (1969) have pointed out that teachers do not have a choice in the question of whether or not their children will be influenced by rewarding or punishing events. The choices teachers have are (1) to learn to use systematic principles of behavior change optimally to facilitate learning in their children; (2) to blindly and haphazardly approach the training of children or (3) to leave the training and development to chance. It would be argued that, the third alternative gives no credit to the teaching profession, and professors and teachers would be serving no useful purpose to society. The second alternative could be viewed as unprofessional or unethical. The first alternative seems to be the most reasonable, logical and, in the present trend of things, most "with-it."

The systematic use of such behavior principles as the literature indicates, helps children to improve their academic learning ability (e.g. Pre-school Program in Compensatory Education, 1969. Glynn, 1970), their social skills and responsibility (e.g. Schutte and Hopkins, 1970, Knowles et al. 1969). In short, competence in the systematic use of operant learning principles produces one of the best conditions for effective teaching and academic progress in children. Practical courses, specifically focused on mastery of these operant procedures, should supplement the present theoretical abstract lectures now offered in teacher preparation institutions. This move would be expected to substantially improve the competence and confidence of the new teachers who enter the profession from the training institutions. Also, through extension programs, in-service training, or compulsory upgrading programs, it would be feasible for teachers already in the field to become more fully equipped to help their children learn desirable academic and social behaviors.

FUTURE RESEARCH

The significance as well as the inadequacies of a study call for future research in certain areas.

One major significance of this study is the finding that teachers and student teachers are significantly different from non teachers on their knowledge of operant learning principles. The real basis of this difference was not the purpose of this study. Future research will determine whether special training in behavior principles does make a difference to teachers' understanding of operant learning principles or whether the difference always exists in any case.

Future research will also determine whether a good understanding of these principles necessarily leads to expertise in their application in the naturalistic situation, or whether special training in this regard is also necessary. The point of this indicated trend in future research hopefully is to demonstrate that the successful and effective utilization of operant principles (or S-R principles) in the educational system can be greatly fostered by adequate theoretical training, opportunity for supervised experimentation and practice, and by consistent usage of the techniques on the part of both student teachers and teachers.

One of the inadequacies of the study was the failure of the researcher to methodologically control for educational level or for cognitive sophistication. This factor was only casually observed as relevant and controlled subjectively. Future research would be directed at determining to what extent educational level affects the difference between teachers, student teachers and non teachers on their understanding of operant learning principles.

One issue which was not part of the purpose of this study, at which future research should be directed is to establish whether, irrespective of special training, period of time in the teaching profession determines one's level of understanding of theoretical principles--in this case operant principles. The point of this would be to discover correlational outcomes between professional longevity and competence in regard to mastery of behavioral principles. Controls would be imposed on motivational and other situation-determined factors. The findings of a study of the latter kind could greatly assist educational decision-makers in setting new teaching conditions which might affect the older members of the profession.

RECAPITULATION AND CONCLUSION

This study was designed to discover how knowledgeable practising teachers were about operant learning principles in relation to student teachers, and non teachers. The Test of Operant Principles was administered to the three groups to determine their relative standing regarding an understanding of these principles. It was discovered, when tested by a one way analysis of variance, that teachers and student teachers were not significantly different from each other but that both these groups were significantly different from non teachers. The extent of this difference was discussed and conclusions were drawn regarding the need for better training in the specific area of the study. Other tests were made for differences which were not central to the purpose of the study but the findings of which proved instructive.

It is fervently hoped however that the plea made earlier will be taken seriously regarding the provision of objective and consistent techniques for classroom instruction. It is also fervently hoped that this plea is not taken as a signal for the multiplication of innovative programs which pay only lip service to consistency and objectivity.

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APPENDIX A

Topics considered as relevant in assessing understanding of operant learning principles:

Positive reinforcement

Negative reinforcement

Secondary reinforcement

Conditioned reinforcement

Partial and continuous schedules of reinforcement

"Punishment"

Extinction and fading

Matching, imitation and modeling

Generalization

Discrimination

Successive approximation and shaping

Response heirarchy

Motivation

Satiation

APPENDIX B--THE QUESTIONNAIRE

INSTRUCTIONS

These questions are intended to test your understanding of human behavior. In particular learning behavior of children. Four answers are suggested for each question and you are asked to demonstrate your understanding by choosing the ONE alternative you think is right or most correct.

e.g. 1. "Hello" is a social greeting

(a) yes
(b) no
(c) used mostly in the U.S.S.R.
(d) only in Canada

Mark all answers on the answer sheet provided.
Use pencil.

e.g. 1. A. B. C. D. E.

---

1. Negative reinforcement essentially means reinforcement:

(a) derived through persistent effort and endurance
(b) derived through the withdrawal of anything aversive or unpleasant
(c) derived through conditions of least effort and greatest economy
(d) derived through a primary source which is not identifiable

2. Grades can be used as incentives to learning because:

(a) in the first place they are incentives
(b) they have been made into incentives
(c) they fit learning situations perfectly
(d) they are objective measures

3. Which of the following illustrates "reinforcement"?

(a) a waiter comes to the table upon hearing the bell
(b) Miss Reed says her speech ten times before a mirror
(c) a man stands up when people arrive at the table
(d) a boy is given a dollar for mowing the lawn

4. It is a common expectation, described in technical language as negative reinforcement, to:

(a) avoid or escape from unpleasant or aversive circumstances
(b) consider alternatives in the light of prevailing conditions
(c) use force in unpleasant or aversive circumstances
(d) calmly consider alternative actions and choose the least aggressive

5. Usually model-effectiveness depends on:

(a) the status of the model
(b) the indications the model gives of his or her intentions
(c) the child's understanding of modelling techniques
(d) the child's understanding of the model's intentions

6. A child learned the meaning of 'Geology' and applied it also to 'Geography.' This is an example of:

(a) carelessness
(b) generalization
(c) discrimination
(d) none of these

7. Satiation refers to:

(a) the cessation of responding due to continued reinforcement
(b) the complete satisfaction of deprived needs
(c) the lavish provision of reinforcement
(d) all of these

8. What punishment does, basically is:

(a) to effect correction or retribution
(b) to temporarily weaken established behavior
(c) to change the child for the better
(d) to strengthen established behavior and make it more likely on subsequent occasions

9. Which of these would you say is <u>not</u> a "social reward"?

(a) money
(b) food
(c) grades
(d) praise

10. Motivation basically or essentially refers to:

(a) factors which increase the vigor of activity
(b) factors which decrease the vigor of activity
(c) factors which determine the level or degree of activity
(d) none of these

11. Speaking loosely, successive approximation:

(a) induces the student to gradually perform the required behavior
(b) forces the student to eventually perform the required behavior
(c) equips the student so he can perform the required behavior
(d) conceals from the student the nature of the required behavior

12. Patterns or schedules of reinforcement in some cases may be:

(a) fixed
(b) unfixable
(c) heavy
(d) light

13. Which of these would you say illustrates learning:

(a) a child starts to cry at the sight of the white coated grocer
(b) a child starts to cry at the sight of the white coated dentist
(c) a child starts to cry at the sight of the white coated painter
(d) all of these

14. A teacher who uses punishment as a teaching tool must realize:

(a) that he may himself acquire conditioned aversive characteristics
(b) that children will sooner run away from school than ever be punished
(c) that, in psychological terms, you only have to "spare the rod" and you will "spoil the child"
(d) that he will himself acquire unconditioned aversive characteristics

15. Which of the following does not illustrate reinforcement:

(a) father presents Peter with a gaily colored book because it was his birthday
(b) teacher presents Peter with a gaily colored book because he is usually punctual
(c) teacher presents Peter with a gaily colored book because he solved the Math problem
(d) neighbor presents Peter with a gaily colored book because he told him it was his birthday

15. Generalization is a process:

(a) by which we learn new things
(b) involving the emission of the same response
(c) by which learning behavior can be shaped
(d) involving all of these

17. Imitation can be used:

(a) in teaching motor skills
(b) in teaching verbal skills
(c) both (a) and (b)
(d) neither (a) nor (b)

18. For motivation to be promoted, it is important for:

(a) potential reinforcers to be located or ascertained
(b) all aversive factors to be removed
(c) anxiety and curiosity to be present in the ratio 1:5
(d) none of these

19. Imitation is encouraged:

(a) by deep affection for the learner
(b) by rewarding approximate imitation
(c) by rewarding only perfect imitation
(d) by maintaining detachment from the learner

20. Providing reinforcement after a certain specified number of responses may be referred to as:

(a) a planned schedule of reinforcement
(b) a specified schedule of reinforcement
(c) a ratio schedule of reinforcement
(d) a point schedule of reinforcement

21. Conditioned reinforcement may be used to refer to situations in which:

(a) a person accepts reinforcement on condition
(b) a person obtained reinforcement in lieu of better reinforcing circumstances
(c) a person is reinforced by things whose reinforcing power is acquired
(d) a person is reinforced by things whose reinforcing power is altered

22. A teacher or parent may make use of imitational tendencies in children:

(a) to punish wrong acts only
(b) to reward correct acts only
(c) to adapt children to novel situations
(d) to ascertain what the child has previously learned

23. The effectiveness of a model, as observed by some authorities, depends on:

(a) whether the model clearly indicates that he or she is a model
(b) the consequences of the model's behavior
(c) how well the model knows the child
(d) whether the child knows the model

24. John finds some pleasure or satisfaction in distracting other pupils who are attending to the teacher. A good teacher should first of all try to:

(a) change John's behavior through modelling
(b) work out a plan of extinction
(c) convince John by argument that his behavior is inappropriate
(d) scold John without making him feel too guilty

25. Satiation might be considered as:

(a) increasing the strength of a behavior
(b) decreasing the strength of a behavior
(c) maintaining the strength of a behavior
(d) producing excitatory behavior

26. Basically the punished child's behavior will be directed towards

(a) challenging the punishment
(b) avoiding the punishment
(c) showing bravery
(d) none of these

27. The principles of motivation are applicable:

(a) more in regard to intellectual activities in the classroom than in moral, social interactions
(b) more in regard to social and moral issues than with intellectual activities
(c) in moral, social and intellectual situations
(d) to a much lesser degree at home than at school

28. Satiation refers to the situation in which:

(a) a need is completely satisfied
(b) a previously rewarding event becomes unpleasant
(c) excessive rewarding stifles activity
(d) all of these

29. If the teacher suspected that Johnny's lack of interest in Math was because he encountered difficult problems in the text book:

(a) he would expect an immediate rise in interest if no difficult problems are assigned
(b) he would expect Johnny to lose interest more and more if no difficult problems are assigned
(c) he would not expect anything to happen with regard to Johnny's interest in the subject if no difficult problems are assigned
(d) he would expect Johnny's interest to increase gradually if no difficult problems are assigned

30. In which of these learning situations would response heirarchies be relevant:

(a) acquiring language
(b) deciding between studying math and social studies
(c) deciding between studying and going to the show
(d) all of these

31. "Social rewards" as applied to classroom learning are useful if:

(a) children have already learned their value and respond to them effectively
(b) their effects do not last long and so do not interfere with the emotional level of the children
(c) they have less psychological and more educational value
(d) they are the best measure of emotional functioning

32. If a child fears every white-coated man, it is an example of:

(a) misplaced fear
(b) stimulus generalization
(c) sensory perception
(d) none of these

33. Which of these classroom examples best illustrates satiation:

(a) the child stops working because the remaining problems are too difficult
(b) the child stops working because he is tired of quadratic equations
(c) the child stops working because he has completed the problem-solving assignment
(d) the child stops working because he has written out too many pages and is tired

34. Reinforcing each occurrence of a response is usually referred to as:

(a) repeated reinforcement
(b) continuous reinforcement
(c) uninterrupted reinforcement
(d) unintermittent reinforcement

35. Which of these would you say provides a better illustration of discrimination learning

(a) the child always runs happily to mum and dad when they return from shopping
(b) the child always runs happily to mum and dad when they return from visiting friends
(c) the child always runs happily to mum and dad only when they return from outside with friends
(d) the child always runs happily to anyone who comes into the house from outside

36. A teacher who finds that his (her) pupils like hearing stories very much, will get them to work harder if:

(a) he presents work and tells stories afterwards
(b) he tells a story and then presents work afterwards
(c) he stops telling stories in the first place
(d) he made them dislike stories

APPENDIX B (CONTINUED)

KEY TO QUESTIONNAIRE

ITEM	CORRECT RESPONSE	ITEM	CORRECT RESPONSE
1	b	19	b
2	b	20	c
3	d	21	c
4	a	22	c
5	a	23	b
6	b	24	b
7	d	25	b
8	b	26	b
9	b	27	c
10	c	28	d
11	a	29	d
12	a	30	d
13	d	31	a
14	a	32	b
15	a	33	b
16	d	34	b
17	c	35	c
18	a	36	a

APPENDIX C

ORIGINAL TEST BEFORE ITEM-ANALYSIS[1]

INSTRUCTIONS

These questions are intended to test your understanding of human behavior. In particular learning behavior of children. Four answers are suggested for each question and you are asked to demonstrate your understanding by choosing the ONE alternative you think is right or most correct.

e.g. 1. "Hello" is a social greeting

(a) yes
(b) no
(c) maybe
(d) never

Mark all answers on the answer sheet provided.

Use pencil.

e.g. 1. A. B. C. D. E.

---

1. As a teacher or parent I know that the best learning conditions for children operate:

(a) when they are hungry
(b) near the end of the day
(c) when they get rewards *
(d) when they are ambitious

2.* Which of these steps, assuming there were no others, would you take to promote learning if the problem was a dislike for an obviously dull textbook.

(a) set exams frequently on various sections in the book so the students have to read the book
(b) discard the book *

---

[1] When following an item number, an asterisk (*) signifies the item was dropped. When following a response it signifies the required response.

(c) assume the judgement of the class is subject to the teacher's direction and proceed to teach the book, cheerfully
(d) tell the class the book has come to stay and stand no nonsense from them.

3. Grades can be used as incentives to learning because

(a) in the first place they are incentives
(b) they have been made into incentives *
(c) they fit learning situations perfectly
(d) they are objective measures

4.* Teachers who give "goodies" to the class once every month or once every term are making use of

(a) continuous reinforcement
(b) repeated reinforcement
(c) unrepeated reinforcement
(d) partial reinforcement *

5.* Punishment might be considered as characteristically

(a) anything painful to the child
(b) some painful experiences of the child
(c) anything the child avoids or attempts to escape from *
(d) none of these

6. The removal of reinforcement tends to

(a) weaken an ongoing response and finally "stop" it *
(b) strengthen the expected response
(c) really do nothing to the ongoing or expected response
(d) destroys the "sensitiveness" of the respondent

7.* If a child insists that a car and a truck are the same it is because

(a) he thinks they are the same
(b) he sees them as the same
(c) he does not know what makes them different
(d) all of these*

8. When a teacher or parent, reinforces behavior which is "near enough" to what he expects in the child, he is

(a) shaping the child's behavior *
(b) being lenient to the child's failure
(c) himself a lazy teacher
(d) "unshaping" the poor child even before the child has learned anything.

9. Which of these would you say does not illustrate learning in the case of a five year old who just started to read

(a) attempting to read a comic
(b) attempting to read the newspaper
(c) attempting to read Mom's diary
(d) none of these *

10. In everyday life, persons are faced with decision making situations. That is to say:

(a) they usually have to decide one way or another
(b) which of several competing responses to make at any one time
(c) a process of shifts in response strength is involved
(d) all of these *

11. * Which of the following promotes motivation

(a) curiosity and exploratory behavior
(b) boredom and an absence of stimulation
(c) both (a) and (b) *
(d) neither (a) nor (b)

12. * A child's noisy behavior is punished by the teacher until he behaves "better." But he becomes so quiet that the teacher begins to get worried. Worried behavior is the effect of:

(a) negative reinforcement
(b) satiation *
(c) confusion
(d) sympathy

13. Which of the following illustrates "reinforcement"?

(a) a waiter comes to the table upon hearing the bell
(b) Miss Reed says her speech ten times before a mirror
(c) a man stands up when people arrive at the table
(d) a boy is given a dollar for mowing the lawn. *

14. * When a teacher uses negative reinforcement she has in other words

(a) removed something unpleasant *
(b) removed something pleasant
(c) applied something pleasant
(d) could be (b) or (c) but never (a)

15. A teacher who finds that his (her) pupils like hearing stories very much, will get them to work harder if

(a) he presents work and follows it with stories *
(b) he tells a story and then presents work
(c) he stops telling stories in the first place
(d) he made them dislike stories

16. Patterns or schedules of reinforcement can be

(a) normal
(b) varied *
(c) unpredictable
(d) abnormal

17. Punishment is:

(a) most effective at all times when a child does wrong
(b) most effective immediately after the undesired behavior *
(c) not effective at any time
(d) most effective long after the undesired behavior

18. Extinction is the same as saying

(a) a person forgets a behavior
(b) a person substitutes a behavior
(c) a person improves his behavior
(d) a person ceases to use a behavior *

19. Sometimes model-effectiveness depends on:

(a) the status of the model *
(b) the indications the model gives of his or her intentions
(c) the child's understanding of modelling techniques
(d) the child's understanding of the model's intentions

20. A child has learned the meaning of 'Geology' and applies it to 'Geography.' This is an example of:

(a) carelessness
(b) generalization *
(c) discrimination
(d) none of these

21. To "wait for" the exact response or behavior you want from a child without providing any help for him:

(a) shows a relatively good understanding of learning principles
(b) shows a relative lack of understanding of learning principles *

(c) is how learning is best fostered
(d) is a reasonable step to take ordinarily in learning

22. A child in grade school whose response to "4x4" is "8", has:

(a) poor math ability
(b) definitely been taught badly
(c) probably not learned discrimination as it applies * here
(d) definite fixation problems which must be investigated by a Psychologist.

23. The operation of response heirarchies is largely based on:

(a) past history of reinforcement *
(b) moral strength or weakness
(c) good memory
(d) none of these

24. Generally speaking motivation is largely dependent on

(a) positive reinforcement
(b) negative reincorcement
(c) various reinforcement contingencies *
(d) response heirarchies

25. Satiation refers to

(a) the cessation of responding due to continued reinforcement *
(b) the satisfaction of deprived needs
(c) the lavish provision of reinforcement consequent upon demand
(d) all of these

26. * Which of these behavioral examples best illustrate the concept of motivation:

(a) Peter, a good swimmer, saw no reason to enter the swimming course to learn more advanced styles
(b) Jean read a whole novel one night for the first time
(c) during the free activity period, Harry got better and better at balancing books on his nose
(d) all of these *

27. What punishment does, broadly speaking is:

(a) to effect correction or retribution
(b) to temporarily weaken established behavior *

(c) to change the child for the better
(d) to strengthen established behavior and make it more likely on subsequent occasions

28. The process of shaping behavior involves:

(a) reinforcing a general class of responses
(b) reinforcing responses approaching desired behavior
(c) both (a) and (b) *
(d) neither (a) nor (b)

29. We do not always have to learn everything

(a) because we know them already
(b) we can generalize *
(c) we can discriminate
(d) we can "borrow" ideas

30. Which of these would you say is not a "social reward"?

(a) money
(b) food *
(c) grades
(d) praise

31. * Motivation refers to:

(a) factors which increase the vigor of activity *
(b) factors which decrease the vigor of activity
(c) factors which determine the level or degree of activity
(d) none of these

32. Which of these steps would you take to extinguish a behavior that you do not approve of:

(a) withdraw any reinforcement
(b) provide an alternative
(c) give the child time to come to his senses *
(d) punish the child if he does not change

33. Speaking loosely, successive approximation

(a) "teases out" the required behavior *
(b) "squeezes out" the required behavior
(c) provides the required behavior
(d) conceals the required behavior

34. In any learning situation, the operation of response heirarchies

(a) should be considered *

(b) should not be considered *
(c) should be avoided
(d) should be denied

35. Patterns or schedules of reinforcement in some cases may be:

(a) fixed
(b) unfixed
(c) heavy
(d) light

36. * Punishment is effective when a rewarded alternative is also presented

(a) false
(b) true *
(c) needs to be proved
(d) sometimes false and sometimes true

37. Praise, smiles, frowns, grades, honors, have the greatest control over learning when they are applied systematically, because:

(a) they acquire effectiveness through systematic association *
(b) they depend on the teacher's maturity for systematic effectiveness
(c) the school is itself a systematic organization
(d) these are particularly likely to be wrongly copied by the pupils

38. A model is

(a) a person who imitates
(b) a person who is imitated *
(c) both (a) and (b)
(d) neither (a) nor (b)

39. * A stimulus in the presence of which a response is reinforced

(a) is a discriminative stimulus
(b) is a differentiated stimulus
(c) both (a) and (b) *
(d) neither (a) nor (b)

40. Motivation should be described in terms of

(a) drive stimulus reduction
(b) reinforcement
(c) contiguity of cue elements and arousal levels
(d) all of these *

41. Which of these would you say illustrates learning

(a) a child starts to cry at the sight of the white coated grocer
(b) a child starts to cry at the sight of the white coated dentist
(c) a child starts to cry at the sight of the white coated painter
(d) all of these *

42. A behavior made in an effort to avoid an unpleasant experience will tend to be exhibited

(a) in the presence of experiences which have been paired with the unpleasant one
(b) when the person remembers the unpleasant experience
(c) in the case of neither (a) nor (b)
(d) in the case of both (a) and (b) *

43. A teacher who uses punishment as a teaching tool must realize

(a) that he will himself acquire conditioned aversive characteristics *
(b) that children will sooner run away from school than ever be punished
(c) that, in psychological terms, you only have to "spare the rod" and you will "spoil the child"
(d) the question of conditioned aversive characteristics does not arise.

44.* Patterns or schedules of reinforcement can be made in terms of number responses emitted or

(a) kinds of responses emitted
(b) number of responses not emitted
(c) passage of time between one administration of the reinforcement and another *
(d) passage of time between the emission of one response and another

45. Which of the following does <u>not</u> illustrate "reinforcement"

(a) father presents Peter with a gaily coloured book because it was his birthday. *

(b) teacher presents Peter with a gaily coloured book because he is usually punctual
(c) teacher presents Peter with a gaily coloured book because he solved the Math problem
(d) neighbor presents Peter with a gaily coloured book because he told him it was his birthday

46. Generalization is a process

(a) by which we learn new things
(b) involving the emission of the same response in the presence of similar stimuli
(c) by which behavior can be shaped
(d) involving all of these *

47. Imitation can be used

(a) in teaching motor skills
(b) in teaching verbal skills
(c) both (a) and (b) *
(d) neither (a) nor (b)

48. For motivation to be promoted, it is important for

(a) potential reinforcers to be located *
(b) all aversive factors to be removed
(c) anxiety and curiousity to be present in the ratio 1:5
(d) none of these

49. Negatively reinforced behavior

(a) cannot become conditioned
(b) usually is not conditioned
(c) can become conditioned *
(d) is not easily conditioned

50. * Which of these is not an example of satiation

(a) as a result of a lack of new stimulation the child becomes habituated to previous stimulation
(b) orienting activity or sensory imbalance is greatly reduced resulting in a state of equilibrium
(c) as a result of continued inhibition a child comes to "lose interest" in excitement around
(d) the explorer now knows the land well enough to discontinue his daily trips *

51. * Discrimination learning is ordinarily promoted by

(a) differential reinforcement
(b) intermittent reinforcement
(c) both (a) and (b) *

(d) neither (a) nor (b)

52. * Children usually develop language usage

(a) by imitating adults and older children *
(b) only be being told what to say by adults and older children
(c) by going to school
(d) by a process distinctly different from these

53. * Conditioned reinforcers are by their nature

(a) innate reinforcers
(b) learned reinforcers *
(c) unadaptable reinforcers
(d) all of these

54. Motivation may be promoted

(a) through the use of incentives
(b) with words
(c) through conditioning techniques
(d) all of these *

55. Imitation is encouraged

(a) by deep affection for the learner
(b) by rewarding approximate imitation *
(c) by rewarding only perfect imitation
(d) by maintaining detachment from the learner

56. Providing reinforcement after a certain specified number of responses may be referred to as:

(a) a planned schedule of reinforcement
(b) a specified schedule of reinforcement
(c) a ratio schedule of reinforcement *
(d) a point schedule of reinforcement

57. Rewards in learning are most effective when they:

(a) immediately follow the act of learning *
(b) immediately precede the act of learning
(c) follow long after the act of learning
(d) precede the act of learning

58. * Motivational factors

(a) are fixed and objective
(b) may vary with culture or social background *
(c) depend invariably on internal psychological states
(d) depend invariably on external conditions.

59. Imitation is a process which takes place

(a) mainly in school
(b) mainly at home
(c) wherever there is a model *
(d) even if there is no model

60. Conditioned reinforcement may be used to refer to situations in which

(a) a person accepts reinforcement on condition
(b) a person obtained reinforcement in lieu of better reinforcing circumstances
(c) a person is reinforced by things whose reinforcing power is "borrowed" *
(d) a person is reinforced by things whose reinforcing power is altered.

61. * Speaking generally, discrimination learning is demonstrated

(a) when the child shows cultural prejudice *
(b) when the child gives the same response in similar situation
(c) both (a) and (b)
(d) neither (a) nor (b)

62. A teacher or parent may make use of imitational tendencies in children

(a) to punish wrong acts only
(b) to reward correct acts only
(c) to adapt children to novel situations *
(d) to control adult-child interaction

63. The effectiveness of a model depends on

(a) whether the model clearly indicates that he or she is a model
(b) the consequences of the model's behavior *
(c) how well the model knows the child
(d) whether the child knows the model

64. The process of extinction involves

(a) using persuasives
(b) withholding reinforcement *
(c) providing reasonable choices
(d) being firm in the face of pleas

65.* One serious drawback in promoting the motivation of others is the problem of

(a) locating adequate reinforcers *
(b) providing incentives continually and consistently
(c) locating and eliminating all aversive factors
(d) channelling energies

66. John finds some pleasure or satisfaction in distracting other pupils who are attending to the teacher. A good teacher should first of all try to

(a) change John's behavior through modelling
(b) work out a plan of extinction *
(c) convince John by argument that his behavior is inappropriate
(d) scold John without making him feel too guilty

67. * If John's inappropriate behavior is reinforced by class admiration, the teacher should then

(a) tell the class to shame John
(b) skilfully direct the class's admiration away from John *
(c) skillfully direct John's attention away from the class
(d) tell John there and then that he's just being silly

68. Satiation might be considered as

(a) increasing the strength of a behavior
(b) decreasing the strength of a behavior *
(c) suppressing an ongoing behavior
(d) producing excitatory behavior

69. * Punishment can be used to teach desired behavior if

(a) applied long and intensely
(b) the only other alternative is the desired behavior *
(c) applied in small doses and for short intervals
(d) the only other alternative is the undesired behavior

70. Basically the punished child's behavior will be directed towards

(a) challenging the punishment
(b) avoiding the punishment *
(c) showing bravery
(d) none of these

71. The principles of motivation are effective

(a) more in regard to intellectual activities in the classroom than in moral, social issues
(b) more in regard to social and moral issues than with intellectual activities
(c) in moral social and intellectual situations *
(d) to a much lesser degree at home than at school

72. A teacher's extreme firmness is successfully countered by a pupil's obstinacy. If the teacher drops his firmness

(a) the pupil is expected to drop his obstinacy immediately
(b) the pupil is expected to take advantage of this weakness and become even more obstinate
(c) the teacher should not expect the pupil to be affected at all
(d) the pupil's obstinacy will decrease at a slow rate *

73. * In a general way, discrimination learning may be seen as

(a) responding selectively in the presence of conflicting stimuli
(b) responding selectively in the presence of similar stimuli *
(c) both (a) and (b)
(d) neither (a) nor (b)

74. If a child says that all adults are clever, it is an example of

(a) daydreaming
(b) poor mentality
(c) parental "slackness"
(d) none of these*

75. When only some responses are reinforced the situation may be referred to as

(a) discontinuous reinforcement
(b) unrepeated reinforcement
(c) partial reinforcement *
(d) interrupted reinforcement

76. * A teacher or parent cannot use negative reinforcement unless he or she knows

(a) that there is some discomfort or difficulty somewhere
(b) that there is no difficulty or discomfort at all
(c) how to remove a source of discomfort or difficulty *
(d) how to increase the discomfort or difficulty

77. For "tokens" like grades, attention, badges, etc. to enhance a learning situation, they must

(a) have acquired reinforcing value for the child *
(b) be applied always and generously to the child
(c) have ethical value for the child
(d) be used in a competitive rather than cooperative atmosphere

78. If the teacher suspected that Johnny's lack of interest in Math was because he encountered difficult problems in the text book

(a) he would expect an immediate rise in interest if no difficult problems are assigned
(b) he would expect Johnny to lose interest more and more if no difficult problems are assigned
(c) he would not expect anything to happen with regard to Johnny's interest in the subject if no difficult problems are assigned
(d) he would expect Johnny's interest to increase gradually if no difficult problems are assigned *

79. Which of these examples of behavior would you say illustrates imitation

(a) the child repeats something the teacher said
(b) the child repeats something he heard on the television
(c) both (a) and (b) *
(d) neither (a) nor (b)

80. * Response heirarchies provide some understanding of

(a) trial and error in learning
(b) decision in learning
(c) neither (a) nor (b)
(d) both (a) and (b) *

81. * Which of these would you say is an example of imitation

(a) the baby says "wawa" when Mom says "water"
(b) the baby says "wawa" to himself and repeats it often
(c) both (a) and (b)*
(d) neither (a) nor (b)

82. In which of these learning situations would response heirarchies be relevant

(a) acquiring language
(b) deciding between studying math and social studies
(c) deciding between studying and going to the show
(d) all of these *

83. * Which of these is not an illustration of punishment

(a) spanking Johnny when he runs into the street for his ball
(b) not spanking Johnny but taking the ball from him
(c) ordering Johnny to leave the ball where it was and return
(d) none of these *

84. "Social rewards" as applied to classroom learning are useful because

(a) children have already learned their value and respond to them effectively *
(b) their effects do not last long and so do not interfere with the emotional level of the children
(c) they have less psychological and more educational value
(d) they are the best measure of emotional functioning

85. When a behavior has been learned or established, extinction of that behavior is:

(a) very easy and soon accomplished
(b) can be difficult and could take very long to accomplish *
(c) not affected at all except through punishment
(d) cannot take place

86. * All theories of motivation implicitly or explicitly refer to the central role of

(a) deprivation and need reduction
(b) cognitive conflicts
(c) arousal and activation
(d) cortical and subcortical activity *

87. If a child fears every white-coated man, it is an example of

(a) misplaced fear
(b) stimulus generalization *
(c) sensory perception
(d) none of these

88. Which of these would you say really illustrates punishment?

(a) telling a child he is naughty or "shaming" him
(b) spanking a child or giving him lines to write
(c) neither (a) nor (b)
(d) both (a) and (b) *

89. In any learning situation one expects to find one of the following

(a) some use for successive approximation
(b) some use of shaping
(c) some use of differential reinforcement
(d) all of these *

90. Reinforcing each occurrence of a response is usually referred to as:

(a) repeated reinforcement
(b) continuous reinforcement *
(c) uninterrupted reinforcement
(d) unintermittent reinforcement

91.* The best means of maintaining optimal learning conditions is

(a) by providing a constant visual stimulation
(b) by providing a constant auditory stimulation
(c) both (a) and (b) *
(d) neither (a) nor (b)

APPENDIX C (CONT'D)

PARTIAL ITEM ANALYSIS FOR
FIRST TRY-OUT SAMPLES
N= 181

Item	Biserial Correlation	Item Difficulty
1	.204	.547
2	.060	.536
3	.408	.663
4	.109	.453
5	.645	.470
6	.196	.569
7	.315	.757
8	.312	.801
9	.380	.486
10	.117	.470
11	.307	.088
12	.114	.066
13	.349	.702
14	.022	.144
15	.380	.768
16	.409	.818
17	.396	.945
18	.354	.807
19	.224	.354
20	.371	.602
21	.337	.768
22	.644	.923
23	.431	.729
24	.283	.481
25	.302	.320
26	.477	.083
27	.277	.442

APPENDIX C (CONTINUED)

PARTIAL ITEM ANALYSIS FOR
FIRST TRY-OUT SAMPLES

Item	Biserial Correlation	Item Difficulty
28	.286	.464
29	.402	.635
30	.267	.696
31	.117	.249
32	.392	.431
33	.306	.337
34	.604	.878
35	.317	.674
36	.107	.392
37	.310	.762
38	.191	.746
39	.182	.177
40	.207	.265
41	.354	.580
42	.306	.387
43	.324	.602
44	.165	.320
45	.352	.547
46	.308	.331
47	.462	.829
48	.356	.453
49	.261	.591
50	.195	.204
51	.062	.193
52	.146	.873
53	.067	.724
54	.593	.807
55	.391	.619

APPENDIX C (CONTINUED)

PARTIAL ITEM ANALYSIS FOR
FIRST TRY-OUT SAMPLES

Item	Biserial Correlation	Item Difficulty
56	.600	.354
57	.677	.906
58	.138	.740
59	.433	.812
60	.364	.249
61	.040	.088
62	.240	.564
63	.359	.657
64	.504	.751
65	.237	.171
66	.384	.669
67	.277	.873
68	.384	.293
69	.061	.409
70	.279	.657
71	.342	.641
72	.298	.459
73	.150	.530
74	.548	.901
75	.205	.735
76	.160	.481
77	.489	.768
78	.523	.696
79	.431	.757
80	.059	.155
81	.061	.287
82	.301	.381
83	.124	.646

APPENDIX C (CONTINUED)

PARTIAL ITEM ANALYSIS FOR
FIRST TRY-OUT SAMPLES

Item	Biserial Correlation	Item Difficulty
84	.408	.751
85	.556	.845
86	.027	.017
87	.418	.746
88	.503	.544
89	.395	.683
90	.291	.650
91	.008	.550
Average	.35244	.54654

TEST STATISTICS -	TEST MEAN	50.24
	TEST VARIANCE	75.21
	K-R-20 RELIABILITY	0.77

APPENDIX D

PARTIAL ITEM ANALYSIS FOR NEGATIVE REINFORCEMENT N = 41

Item	Difficulty Index	Biserial Correlation	Comments
1	.268	.614	Too difficult
2	.683	.467	Two distractors are very poor
3	.756	.899	Generally acceptable
4	.585	.538	Two distractors are very poor
5	.634	.500	One distractor is poor
6	.512	.236	One distractor is very poor
7	.537	.428	One distractor is very poor
8	.875	.773	One distractor is very poor
9	.700	.667	Two distractors are poor
10	.825	.388	Two distractors are poor
11	.675	.663	Generally acceptable
12	.600	.800	Generally acceptable

APPENDIX E

PARTIAL ITEM ANALYSIS FOR FINAL TEST (ACTUAL EXPERIMENTAL SAMPLE)*

N = 403

ITEM	DIFFICULTY INDEX	BISERIAL CORRELATION
1	.634	.433
2	.653	.564
3	.664	.633
4	.595	.613
5	.397	.329
6	.709	.313
7	.394	.206
8	.554	522
9	.694	427
10	.539	274
11	.539	528
12	.677	359
13	.584	286
14	.608	490
15	517	459
16	563	254
17	808	638
18	577	375
19	659	492
20	332	346
21	629	490
22	539	406

* TEST STATISTICS —

TEST MEAN	20.41
TEST VARIANCE	30.25
K-R RELIABILITY	0.73

APPENDIX E (CONTINUED)

PARTIAL ITEM ANALYSIS FOR FINAL TEST
(ACTUAL EXPERIMENTAL SAMPLE)*

	ITEM	DIFFICULTY INDEX	BISERIAL CORRELATION
**	23	591	136
	24	397	478
	25	375	454
	26	489	461
	27	763	498
	28	261	165
	29	.690	
	30	401	.258
	31	683	.471
	32	772	.738
	33	363	.312
	34	657	.413
	35	437	.351
	36	778	.482

* TEST STATISTICS - TEST MEAN 20.41
TEST VARIANCE 30.25
K-R RELIABILITY 0.73

** More of these items appear in different wording as other items in the test and have more acceptable difficulty and discrimination indices.